Vol. XXXII. Part 1.

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Biological & Medical Serials

THE AGRICULTURAL GAZETTE OF NEW SOUTH WALES

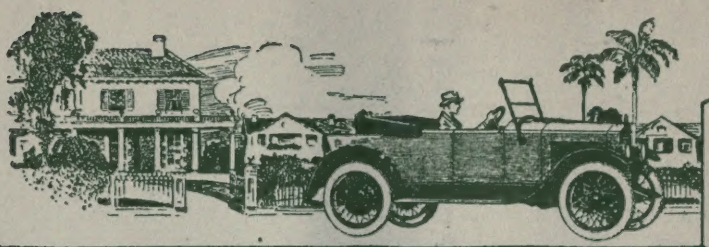
STORAGE

JANUARY

1921

Registered at the General Post Office, Sydney, for transmission by Post as a Newspaper.

Price SIXPENCE.



ESSEX MOTOR CARS

THE ESSEX is a light Car of high-class manufacture and extreme refinement.

It is built in the HUDSON factory alongside the famous "SUPER-SIX."

It possesses many HUDSON features, including the patented "compensated" crankshaft, and although the rated horse-power is but 18, the engine actually develops 55-brake horse-power.

The remarkable combination of light weight, high power and durability in the ESSEX, renders it particularly suitable for our country roads, where loose sand, creeks, etc., have to be negotiated.

THE CAR THAT IS LIGHT ON TYRES.

DALGETY & COMPANY LIMITED
136 PHILLIP ST. SYDNEY.

Agricultural Gazette of New South Wales Vol. 32. 1921

T. P. & C. I, A-9.

14 Plates (8 x m.) paged as follows

32a, 48a, 108a-B, 184a,
200a-B, 260a-B, 412a, 428a,
564a, 624a-B.

SUNLIGHT
SOAP

Plant Lemoto
Queensland

Agricultural Gazette of New South Wales. Vol. 32. 1921

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THE CAR THAT IS LIGHT ON TYRES.

DALGETY & COMPANY LIMITED
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LEVER BROTHERS
LIMITED,

can now supply

Sunlight Oil Cake

For Prompt Delivery.

Sunlight Works :· BALMAIN. N.S.W.

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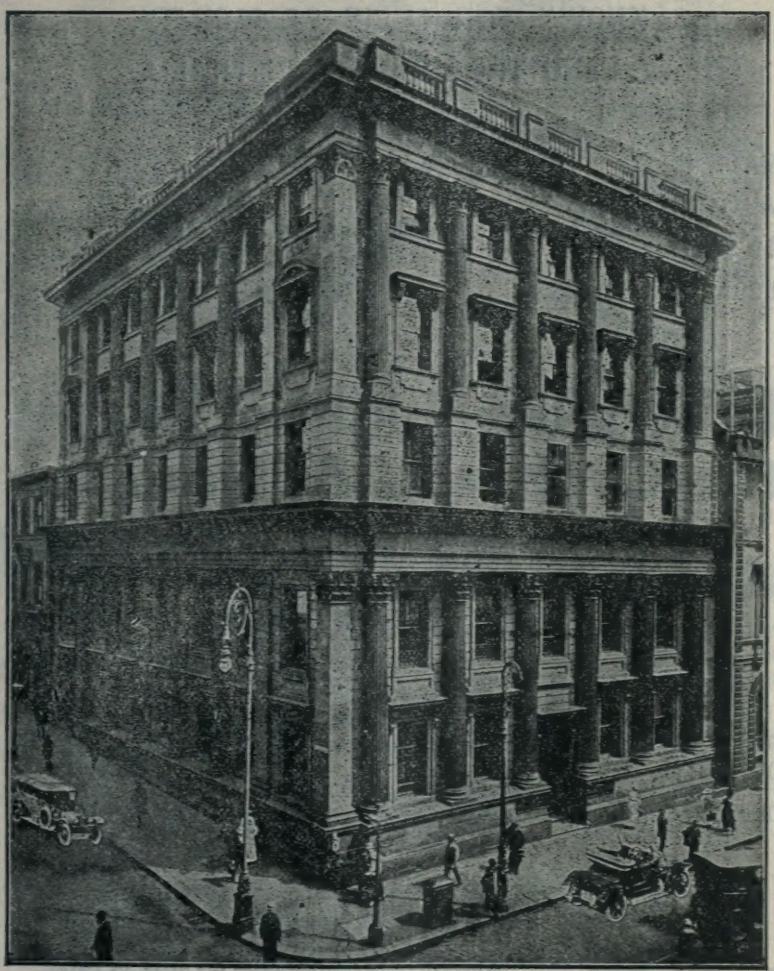

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KNOWN FOR THEIR RELIABILITY,
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MADE IN
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TO MEET
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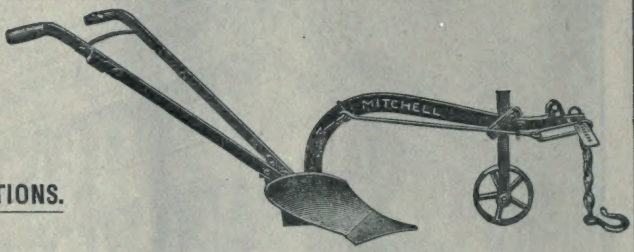

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LIGHT,
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THE BEST POSSIBLE MADE IN AUSTRALIA

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Australian Manufacturers for over 25 years.

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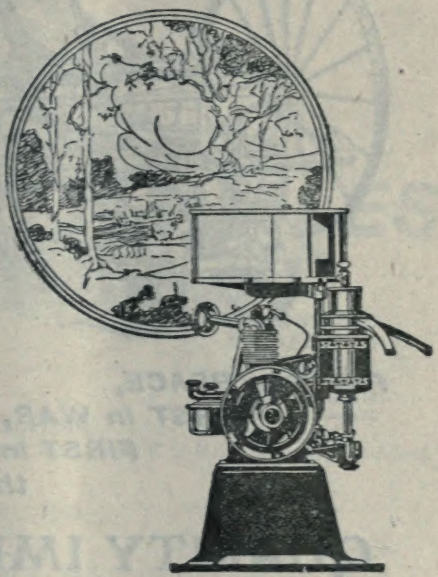
Corner BURWOOD ROAD,
SYDNEY.

Wages Continue to Rise!

THERE is only one thing the farmer can do—instal effective mechanism to do all work that can be done better and quicker by machines.



The "Automatic"

is the most practical separator for quick and effectual skimming.

Mr. T. A. SQUELCH, of Bangalow, who has used one for 7 years, says the "Automatic" is the greatest labor-saver a man can have in his dairy.

Cut down costs by installing an "Automatic"—the separator that saves.

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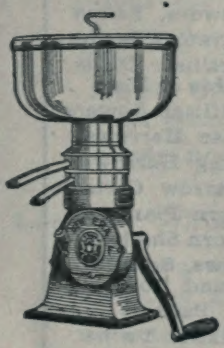


The "New Era" Separator.

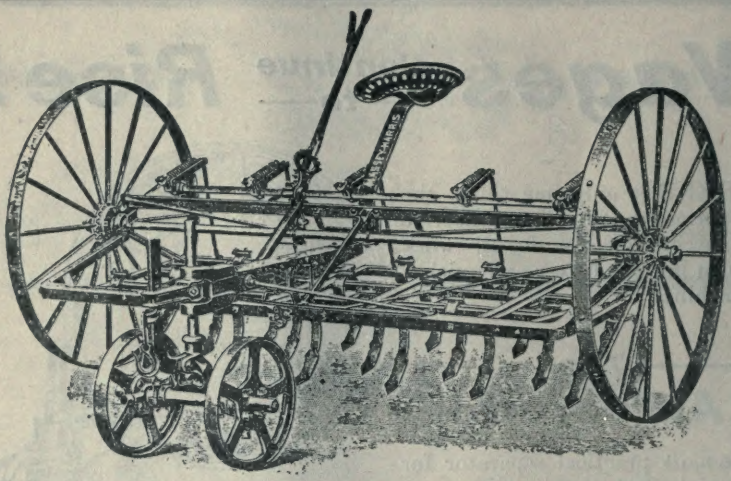
ALMOST economical and efficient hand-separator. All gears are enclosed. Absolutely dust-proof. Ball-bearings interchangeable and adjustable.

The "New Era" skims close and saves all the cream.

Let us send you the testimony voluntarily sent to us by hundreds of pleased owners of the "New Era."

Buzacott & Co. LIMITED

7-11 Market Street — Sydney.



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FIRST in WAR,
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the N.S.W. FARMERS.

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The call to-day is for "QUALITY" The matter of price does not carry so much weight with the careful buyer as does the "QUALITY" of the goods--the Quality is remembered long after the Price is forgotten. The Massey-Harris Trademark stands for "QUALITY" ----- Massey-Harris Implements are famous for Efficiency, Durability, Simplicity, Reliability and Economy.

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Look for the
MASSEY-HARRIS
Trademark when buying
your Farm Implements.

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ESTABLISHED 1817.

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WITH A WONDERFUL REPUTATION.

Cooper "Little Wonder"

2-STAND SHEARING AND CRUTCHING OUTFIT.

Known the world over for its high quality of construction, low cost of upkeep, and long life.

Write for illustrated leaflet, and read what owners say. It's **their** opinion, not ours, that counts.

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FENCING WIRE

HAS THIS TAG ATTACHED TO PROTECT YOUR POCKET

This tag guarantees you QUALITY IN EVERY INCH—it guarantees you a fencing wire that has a much GREATER BREAKING STRAIN and a MUCH LOWER COST than imported wires.

WARATAH FENCING WIRE is manufactured from finest quality iron ore by a special process which eliminates effect of climatic conditions. It is thoroughly tested before leaving the mill, and is true-to-gauge from end to end.

YOUR STOREKEEPER CAN SUPPLY WARATAH WIRE.

See that you get the WARATAH IDENTIFICATION TAG on each coil you buy. Ample Stocks are available. Fence with WARATAH FENCING WIRE—From the Ore to the Fence Australian.

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AUSTRAL NAIL CO. PTY., LTD., 310 Flinders Street, Melbourne, Vic.

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MEYER

High Prices

BECAUSE OF THE WORLD indications point to a high price but farmers in the wheat belt will be advantages of other crops next year.

THE PRODUCTION OF MALTING below local requirements, whilst, since the South Australia has been established, with

TOOTH & CO., Limited,

are buyers of new season's N.S.W. suitable quality for malting, and farmers

for Cereals.

SHORTAGE of Foodstuffs, present being realised for this year's wheat crop, well advised not to lose sight of the

BARLEY in New South Wales is still far war, an export trade from Victoria and prospects of great development.

Kent Brewery, Sydney,

Barley, both two-row and six-row, if of are invited to submit samples to them.

Commonwealth Bank of Australia

OPEN FOR ALL CLASSES OF

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PRINCIPAL CITIES and TOWNS of Australia, London, 2, and Rabaul (New Britain).

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Cable Remittances made to and Drafts drawn on foreign places direct.

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Conducted at all Branches and at over 3,049 Post Office Agencies in Australia, Papua, New Britain, Solomon Islands, and the Pacific.

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Rate of Interest, 3½ per cent. on amounts up to £1,000; 3 per cent. in excess of £1,000 and not exceeding £1,300.

Deposits or Withdrawals may be made at any Branch or Agency.

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Interchangeable facilities with P.O. Savings Banks in United Kingdom and New Zealand.

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100 % EFFICIENT

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MILKING MACHINES

Have Completely Revolutionised Machine Milking.

THE **"AUTO" VARIABLE PULSATOR** eliminates the only prejudice against Machine Milking—each individual cow receiving

PROPER MILKING TREATMENT.

It is a well-known fact that some cows are "hard" and some are "easy" milkers. Hitherto no provision has been made for this variation. With the "**AUTO**" there is a separate Pulsator in each bail, working independently of each other, and by simply moving a lever, and without stopping the plant, the

PULSATION IS INSTANTLY ALTERED

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TO SUIT EACH COW MILKED.

The "**AUTO**" Cups are simple, easy on the cows, and easily and quickly taken apart for cleaning purposes. The removable rubber lip is a big improvement on metal rings.

Cut out the Drudgery in the Cow Shed!
YOU ARE LOSING MONEY!
Write TO-DAY and we will send you full particulars.

The Farmers' Fertilizers Corporation,
LIMITED.

31 HUNTER STREET.

SYDNEY.

C. P. C. CARBONATE OF LIME

FERTILIZER

Is finely ground and is a combination of Carbonate and Hydrate of Lime. This is the best and most economical way to apply Lime, as part is available for plant food immediately, and the balance later on as it is needed.

PRICE—On trucks, Portland, 36/- per ton (14 bags).

Present Freight per ton.	Miles.	In truck lots.	In ton lots.
	50	5/-	7/11
	100	6/6	13/7
	200	7/6	21/6
	300	9/9	26/4

Single bags 6/6, delivered to any suburb of Sydney.

IT'S USES ARE—

To sweeten SOUR soils. It will CHECK all Fungoid Growths and put all land in BETTER HEART.

To SUPPLY LIME to soils DEFICIENT in this ingredient.

To SUPPLY LIME to certain crops which require it in LARGER PROPORTIONS than are usually present in the soil.

To provide the NECESSARY BASE for the growth of SOIL ORGANISMS, notably the NITRATE producing organisms, on whose presence the FERTILITY of the soil largely depends.

INCREASING the available POTASH and NITROGEN by liberating them from compounds already in the soil in which these plant foods are locked up.

To LIGHTEN and OPEN UP stiff clay soils.

To ameliorate loose sandy soils, on which it has a BINDING ACTION.

SAMPLE ON APPLICATION.

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The Makers of "Union" Cement.

POTASH PAYS!

ON ALL SOILS
FOR ALL CROPS

Plants require POTASH in order to make a normal growth.

POTASH is essential to keep plant life healthy.

Used in orchards, POTASH improves the yield and quality of the fruit.

POTASH may be obtained from the leading Fertiliser Merchants and their Agents throughout the State.

THE ALSACE-LORRAINE DEVELOPMENT AND TRADING CO., LTD.

DALGETY & COMPANY LTD.,
SOLE AGENTS FOR AUSTRALIA.

THE DECEMBER RAINS MAKE THOROUGH SPRAYING ESSENTIAL.

Precautions must be taken to Prevent Downy Mildew of the vines and the infection of Peach Trees with Brown Rot, and Apple Trees with Powdery Mildew.

"ORCHARD" Brand Sprays will save your crops!

Bordeaux Paste and Powder for Downy Mildew.

A certain preventative ensuring clean healthy vines. The Paste and Powder are equally effective. You are sure of uniform standard of strength if you get the "Orchard" Brand. It does not disfigure the fruit like home-made Bordeaux.

Atomic Sulphur for Brown Rot and Powdery Mildew.

The only sure remedy for these diseases. Use it NOW before the diseases take hold.

Spraying with a "BEAN" Pump means healthy orchards—at high pressure and low cost.

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Grain, Insurance & Agency Co. Ltd.

Handle all our PRIMARY PRODUCTS with EFFICIENCY and EXPERT SKILL at a MINIMUM of EXPENSE.

CO-OPERATION—and what it means to **YOU**

COMPARE
THE PAST
WITH THE
PRESENT.

The future of CO-OPERATION is in YOUR HANDS—Be strong for it!

Wire: "Grain" Sydney.

Consign: "Farmers & Graziers'."

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WHO USES THE SUDDETH RABBIT FUMIGATOR?

I. M. O'SULLIVAN, Borenore—
"I purchased 6 years ago—no man should be without one."

T. REYNOLDS, Junee—
"I purchased 5 years ago—It has given every satisfaction."

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"Being satisfied with the Suddeth, I desire you to send me two more."

Wm. KNEALE, Parkes—
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H. E. CRANE, Coonabarabran—
"I wish I had ordered before."

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"After 2 years—I say it is the best investment I ever made."

L. SPRAGUE, Tamworth—
"The best I have tried in hilly country."

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"Far the best method of dealing with bunny."

Wm. RICHARDSON, Baan Baa—
"I would not like to be without it"

MAKE UP YOUR MIND TO SECURE AN OUTFIT THAT KILLS YOUR RABBITS QUICKLY AND CHEAPLY.

The SUDDETH generates smoke without fire—Kills in deepest and longest dead ends.

PRICES F.O.B. SYDNEY.

No. 1 Suddeth and Smoker - - -	£6 5 0
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Patent Smoke Mixture, per box - -	15 6
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Pour in the milk and the DIABOLO pours out the profit

THE DIABOLO is a great money maker. It does pour out the profit. And, further, it gets you ALL the profit by skimming to the last sign of butterfat.

More than 1,000,000 dairy farmers find the simple, sweet-running DIABOLO a lasting joy as well as a money-making investment. It cleans so easily. It handles more milk than other machines. It's the easiest-running separator built.

The DIABOLO is made in the world's largest separator factory by the world's greatest experts. That explains the low cost and perfect design that soon repays for throwing out old and inferior machines.

Ask to-day for particulars of 30-days' free trial offer. No expense or obligation to you.

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DIABOLO SEPARATORS

COLD STORAGE WITHOUT ICE.

THE "TRAFALGAR" COLD SAFE

SOLVES THE PROBLEM.

WHAT IT DOES.

It keeps food Cool in the hottest weather, Milk retains its freshness, Meat and Cream are preserved by its action, and the worries of the Housewife are lessened by having one in the home.

IT HAS UNIQUE FEATURES.

IT IS A NECESSITY IN COUNTRY DISTRICTS OR TOWNS.

IT IS HYGIENIC, CLEAN, AND EFFICIENT.

REMEMBER IT IS A COLD SAFE—NOT A COOLER.

THE "TRAFALGAR" COLD SAFE

IS made of Galvanised Iron throughout. It is absolutely fly-proof, and can be used as a refrigerator anywhere, water only being required, which is daily put in the receiving tank on top. It then automatically works itself by the dripping of the water through small taps on to the patent detachable gauze screens (see illustration), which fit into slots on the four sides of Safe, the surplus moisture being caught in a projecting tank at the bottom, which is supplied with a draining tap. There is no upkeep, only the first cost. Unlike the ice-chest, it can be used the whole year round. When the hot weather is over, the patent gauze screens can be scrubbed and put away until the following summer, leaving it a well-ventilated Safe for winter use. Over 3,000 sold in N.S.W. to satisfied users. Many have paid similar tribute as the following :—

Mr. L. ECKFORD, Glenroy, via Millie, writes :—

"You can confidently sell the Safe as a success."

Mr. C. W. TAYLOR, Dalkeith, Uralla, writes :—

"I find it a splendid Safe, especially in hot weather."

Made in Australia in five sizes—COLLAPSIBLE. STOCKED BY ALL LEADING STORES.

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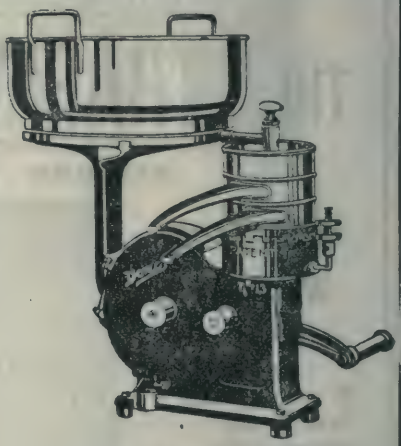
'PHONE—B 4646.

The DOMO SEPARATOR

Skims to Butter Factory Standards.



MODELS 13 to 16.
45 to 135 gall. per hour.

THE "DOMO" bowl delivers dense cream without clogging, and skims to butter factory standards. Furthermore, the accumulation of sediment after prolonged work does not affect its balance.

Because of its lower speed the "DOMO" works silently and turns with less exertion. Handle speeds are 5 to 10 turns per minute slower than other good separators.

This explains its reputation for economy on spares.

It also explains why the machine is being purchased by dairymen who have seen or have heard of its performance over a long period of years.

The "Domo" Purifies Cream.

Even after milk has been carefully strained it contains many impurities which can affect the quality of the cream—and of the butter.

The "Domo" Skimming Bowl removes these impurities, because it has ample circulating space. For the same reason, it skims clean.

When the milk enters the Bowl all foreign matter is immediately thrown to the bottom, where it remains until separation is completed, and until the Bowl is washed.

Shall we post you a Catalogue?

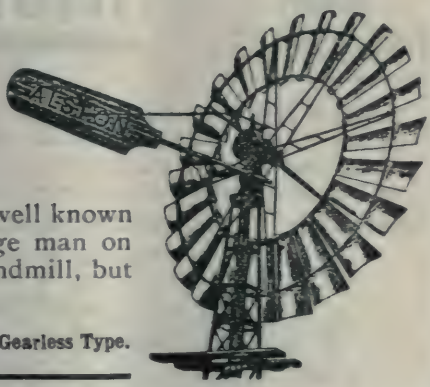
The Domo Separator Co.,

Third Floor, 70 Wentworth-avenue ∴ ∴ SYDNEY.

If you can raise the wind

ALSTON WINDMILLS

can raise the water.



The name "ALSTON" is so well known in Australia that the average man on the land thinks not of a windmill, but of an "ALSTON."

Large Stocks of all sizes—Duplex and Gearless Type.

If you can't raise the wind

let a "Z" or

ECLIPSE —PUMPER—

lift your water.

Both of these pumpers give you a sturdy, reliable engine for other farm work when not pumping.

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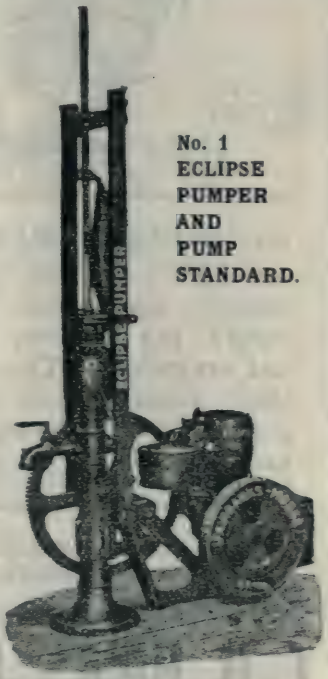

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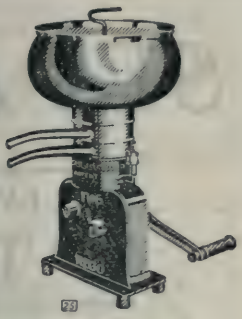

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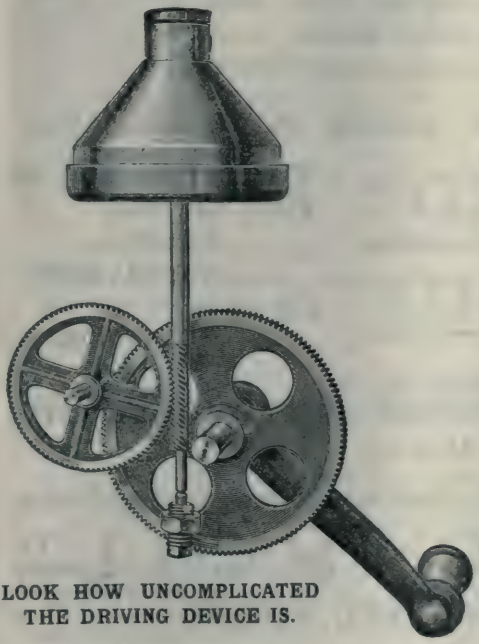

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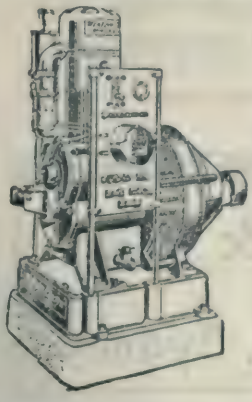

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3rd January, 1921.

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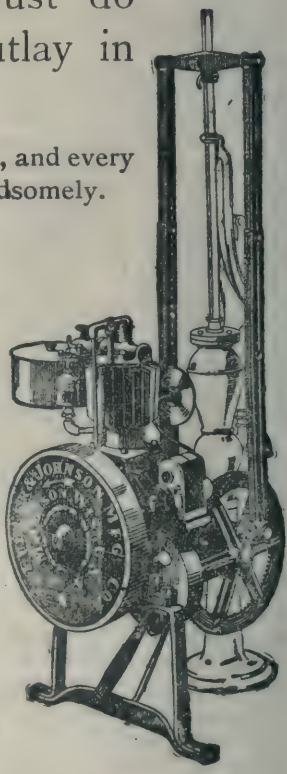

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Agricultural Gazette of New South Wales.

Field Experiments With Maize.

GRAFTON EXPERIMENT FARM, 1919–20.

E. S. CLAYTON, Experimentalist.

THE early portion of the season was very dry, and very little rain was received during the spring, but splendid rains were experienced during the hot summer months, resulting in good yields from the late-sown maize crops. The incidence of the rainfall was as follows:—

1919.	Points.	1920.	Points.
July	31	January	555
August	43	February	266
September	6	March	357
October	125	April	293
November	164	May	283
December	505	June	179

No extremely high summer temperatures were recorded. Harvesting operations were delayed by continued rain towards the latter part of the season.

Hilling v. Flat Cultivation.

Flat cultivation is practised by many farmers, others hill with the plough, and some farmers have recently used the disc cultivator for hilling maize. The object of this experiment was to obtain data regarding the merits of these different methods of cultivation.

The experiment was situated on the black alluvial soil of the farm. The land had previously been occupied by a crop of wheat, which delayed its preparation until October, when it was ploughed 8 inches deep with a disc plough and cultivated three times with a disc cultivator. The soil worked into very fair tilth, considering the lateness of the preparation.

Leaming maize was sown on 18th November, with a maize-dropper, in rows 4 feet apart, three grains being dropped every 40 inches; two small mouldboards were adjusted on the front of the machine, so that the seed would be deposited on the moist soil below the surface. On account of the land being previously occupied by a wheat crop, and the consequent delay in preparing the soil for the maize, germination was not quite satisfactory.

The crop was rolled with a light roller on 12th December, and cultivated with a single-horse implement on 13th December, and the cultivations were continued at frequent intervals to conserve moisture and destroy the vigorous weed growth. The single-horse cultivator, of course, takes longer than the two-horse implement, but much cleaner work can be performed with the former. The cultivations were the same throughout all the plots, with the exception of the methods of hilling; hilling was carried out when the plants were about 2½ feet high. None of the plants showed any tendency to lodge. The

main benefit derived from the hilling was the smothering of the weeds in the rows, and this was effectively done by both the plough and disc cultivator. The plot hilled with the disc cultivator presented the cleaner appearance, and fewer roots were damaged in the process than in the case of the plot hilled with the plough. Sixty-three points of rain fell between 18th and 30th November, making the total up to the end of April, 2,039 points. The crop was harvested 2nd July with results as follows:—

Treatment.	Yield per acre.	Increase or decrease due to treatment.	Value of increase or decrease.	Cost of increase or decrease.	Net gain.	Net loss.
	bus. lb.	bus. lb.	£ s. d.	s. d.	£ s. d.	£ s. d.
Hilled with disc cultivator.	48 41	+3 55	+1 11 10	4 0	1 7 10	.....
Flat cultivator	44 42	.....	.....	.....	.....	.....
Hilled with plough ...	42 19	−2 23	−0 19 3	6 0	.....	1 5 3

\+ Indicates plus. − Indicates minus.

Maize was reckoned at 8s. per bushel, the cost of hilling with a disc cultivator at approximately 4s. per acre, and the cost of hilling with a plough at 6s. per acre. The result of the experiment shows that hilling with a disc cultivator resulted in a net gain of £1 7s. 10d. per acre, and hilling with a plough occasioned a loss of £1 5s. 3d. per acre.

Experiment with De-suckering.

The aim of this experiment was to obtain data regarding the merits of de-suckering—that is, removing the suckers. The value of the increased yield (if any) caused by removing the suckers must be set against the cost of the extra labour involved, and the value of the green fodder obtained by removing the suckers must also be taken into consideration.

The experiment was situated on black alluvial soil. The land was ploughed 9 inches deep with a disc plough early in July and allowed to lie in the rough for five weeks; it was then cross-ploughed to a depth of 5 inches and harrowed down. The disc cultivator was used after every fall of rain sufficiently heavy to cake the surface of the ground. Moisture was thus conserved and weeds destroyed.

The soil was in ideal condition at the time of planting. Leaming, a variety which suckers rather freely, was planted with a maize-dopper on 17th December, in rows 4 feet apart, three grains being dropped every 40 inches. The land had been thoroughly prepared and the soil was well supplied with moisture, consequently the germination was excellent. The experiment consisted of two plots, each half an acre in area.

Cultivation was commenced early. All weeds were kept in check and moisture conserved by the frequent use of the single-horse cultivator.

As the crop suckered freely, considerable time was occupied in de-suckering. The area of the plot suckered was half an acre, one man taking five hours to complete the operation. With labour at 1s. 7d. per hour, the cost of suckering in this particular instance was at the rate of 15s. 10d. per acre. The untreated plot yielded 70 bushels 34 lb., and the suckered plot 69 bushels 55 lb., so that the result was a loss of 35 lb. maize. It was estimated that 1 ton of greenstuff per acre was obtained by de-suckering. Maize was valued

at 8s. per bushel and the greenstuff at 15s. per ton. This makes the value of the increase 15s. for greenstuff minus 5s. for maize, or a net gain of 10s. As the cost of treatment was 15s. 10d., the total result of de-suckering was a loss of 5s. 10d. per acre.

Deep v. Shallow Cultivation.

The aim of this experiment was to determine what depth of cultivation gives the highest yield of grain.

The preparation of the land and the sowing details were identical with those of the hilling *versus* flat cultivation experiment. The crop was sown on 19th November, Leaming being the variety of maize planted.

The cultivations were commenced on 13th December; they were all given on the flat, and were continued until tasselling time. The plots receiving shallow cultivation (2 to 3 inches deep) presented a fairly clean appearance; the cultivations were apparently sufficiently deep to check weed growth and to maintain an effective soil mulch without damaging the roots of the maize plants. The plot receiving deep cultivation (5 inches deep) presented the cleanest appearance throughout: all weed growth was destroyed, but the roots of the maize plants were certainly damaged in the process, especially toward the later stages of growth, the effect being visible to a small extent in the growing crop. The plot receiving deep cultivation (5 inches deep) till the plants were about 15 inches high, and then shallow cultivation (2 to 3 inches) until tasselling, presented much the same appearance as the plot receiving shallow cultivation throughout. The crop was harvested on 20th August.

Treatment.	Yield per acre.	Increase or decrease due to treatment.	Value of increase or decrease.	Cost of increase or decrease.	Net gain.	Net loss.
	bus. lb.	bus. lb.	£ s. d.		s. d.	£ s. d.
Deep cultivation then shallow	43 16	+ 0 24	+0 3 5	Nil.	3 5	...
Shallow cultivation	42 48	...	...	...	...	...
Deep cultivation throughout...	39 10	— 3 38	—1 9 5	Nil.	...	1 9 5

\+ Indicates plus. — Indicates minus.

Maize was valued at 8s. per bushel: the difference in cost between deep and shallow cultivation was practically negligible. The experiments showed that deep cultivation till the plants were about 15 inches high and then shallow cultivation till the time of tasselling resulted in a net gain of 3s. 5d. per acre over shallow cultivation throughout. Deep cultivation throughout resulted in a loss of £1 9s. 5d. per acre.

Green Manuring Experiment.

The aim of this experiment was to determine which is the most suitable green manure crop to grow in a crop of maize to maintain or increase the fertility of the soil when maize is grown year after year.

The land had previously been occupied by a crop of wheat, and this delayed the preparation for the maize crop. Ploughing was commenced on 5th November; the land was then rolled and harrowed, the disc cultivator was used on 18th November and again on 28th November, and the area was then cross-harrowed prior to sowing.

Improved Yellow Dent was sown with a maize-dropper on 18th December in rows 4½ feet apart, three grains being dropped every 40 inches. No fertiliser was applied. The germination was excellent throughout the experiment, and the crop made splendid growth.

Thorough cultivation was given, and the crop always presented a very clean appearance. The maize was hilled with a disc hiller, and the cultivations were continued until 5th March, when the maize was tasselling; the green manure crops were then drilled in between the rows of maize. Grey field peas, rape, and vetches were the green manure crops tried. The rates of seeding were as follows:—Field peas, 12 lb. per acre; vetches, 10 lb.; rape, 1½ lb. With the exception of the rape, the green manure crops germinated well. The best growth was made by the field peas, which grew exceptionally well between the rows of maize.

As this experiment was inaugurated in 1919, this season's crop is simply the foundation for the experiment; next season's results should show the effect of the various green manure crops (grown and ploughed-in this season) on the yield of maize. At the same time, the results shown here indicate that the yields of maize are not materially affected by catch crops sown at tasselling stage. The maize was harvested on 3rd August.

Treatment.	Yield per acre.	
	bus.	lb.
Maize with rape sown at tasselling stage ...	69	52
Maize with Grey field peas sown at tasselling stage	68	11
Maize alone	66	30
Maize with vetches sown at tasselling stage ...	63	25

The cost per acre of producing the green manure crops was:—Rape, 4s. 8d.; field peas, 6s. 4d.; vetches, 6s. 10d. Labour was valued at 1s. 8d. per hour, field peas 15s. per bushel, rape 11d. per lb., vetches 21s. per bushel. These figures will be charged against the maize crop next season.

Late Cultivation Experiment.

This experiment was carried out with the idea of comparing the yield of maize cultivated up to tasselling time with that of maize receiving only one cultivation after hilling. The preparation of the land and the details of sowing were identical with those of the suckering experiment. Leaming maize was sown on 18th November; the soil, having received thorough preparation, was in good tilth; consequently the germination was excellent, and the crop made splendid growth.

The season was moist, consequently weeds were troublesome, and the cultivator had to be frequently used to check their growth. The first cultivation was given three weeks after planting, and three cultivations were given before hilling. This latter operation was carried out when the crop was about 18 inches high; one cultivation was then given throughout to clean

out the "middles." Up to this stage all the plots received exactly the same treatment. One plot thereafter received no further cultivation; the others received two more cultivations—that is, they were cultivated up to tasselling time. These plots were quite free from weeds at harvest time, and presented a much cleaner appearance than the plots receiving only one cultivation after hilling. The crop was harvested early in July.

Treatment.	Yield per acre.	Increase due to treatment.	Value of increase.	Cost of increase.	Net gain.
	bus. lb.	bus. lb.	£ s. d.		£ s. d.
Cultivated to tasselling	68 36	5 20	2 2 10	Two cultivations, 10s.	1 12 10
Only one cultivation after hilling	63 16	...	...	.....	...

Maize was valued at 8s. per bushel, and the cost of a single-horse cultivation between the rows was reckoned at 5s. per acre. The results show that an increase of £1 12s. 10d. per acre was obtained by cultivating the maize right up to the time of tasselling, instead of ceasing cultivation after hilling.

Rate of Seeding Experiments.

The object of these experiments was to determine what rate of seeding gives the highest yield of grain. Two varieties of maize were used to conduct the trials—Leaming and Improved Yellow Dent. In both experiments, maize was valued at 8s. per bushel, and seed maize at 12s. 6d. per bushel.

Leaming Experiment.—The land was ploughed 8 inches deep in July, and the disc cultivator was used to conserve moisture and destroy weed growth. The winter was very dry; the rainfall for the months of July, August, and September was 31, 43, and 6 points respectively. The land was re-ploughed in September. Very little weed growth appeared after this second ploughing, and the land was cultivated only after every fall of rain sufficiently heavy to cake the surface of the ground. The land was cross-harrowed on 13th November, and the experiment was planted with a maize-dropper on 17th November in rows 4 feet apart at the following rates of seeding:—

Distance apart.	Grains per Acre.	lb. per Acre.
3 grains every 40 inches... ...	9,801	6·5
3 ,, 32 ,, ...	12,251	8·1
3 ,, 28 ,, ...	14,001	9·3
3 ,, 20 ,, ...	19,602	13·0

There are 1,508 grains of Leaming to the lb. No fertiliser was applied to any plot. The soil was in ideal condition, and the germination was excellent throughout the experiment. Cultivation between the rows was commenced on 8th December, and all weed growth kept in check by frequent cultivations until the maize tasselled. Twenty inches of rain fell during the growing period of the crop, consequently the growth was exceptionally good, especially on the thickly seeded plots. The more thickly

seeded plots did not sucker so freely as those sown at the thinner rates of seeding. The crop was harvested early in July.

Treatment.	Yield per Acre.	Increase due to treatment.	Value of Increase.	Cost of Increase.	Net Gain.
	bus. lb.	bus. lb.	£ s. d.		£ s. d.
3 grains every 28 inches	88 29	12 12	4 17 8	2·8 lb. seed extra, 7d. ...	4 17 1
3 ,, 20 ,,	89 16	11 55	4 15 11	6·5 lb. seed extra, 1s. 5d.	4 14 6
3 ,, 32 ,,	85 23	8 6	3 4 10	1·6 lb. seed extra, 4d. ...	3 4 6
3 ,, 40 ,,	77 17	.....	.....	.....	.....

Improved Yellow Dent Experiment.—The site selected was portion of an old lucerne field. The lucerne was ploughed out early in August with a single-furrow disc plough, and harrowed down with heavy harrows. The land was again ploughed in September to a depth of 10 inches, then rolled and harrowed, ploughed again in October, and cultivated with a disc cultivator. All the lucerne was by this time eradicated, and the land was in excellent condition. Planting operations were carried out on 13th December. The maize was sown with a maize-dropper in rows 4½ feet apart. No fertiliser was used. Plots were sown at the following rates of seeding :—

Distance apart.	Grains per Acre	lb. per Acre.
3 grains every 40 inches... ...	8,712	8
3 ,, 32 ,, ...	10,890	10
3 ,, 28 ,, ...	12,446	11½
3 ,, 20 ,, ...	16,924	16

There are 1,110 grains of Improved Yellow Dent to the lb. The land had been well prepared, and was in excellent condition. Useful rains were received prior to planting, and the germination was very satisfactory throughout the experiment. Cultivation was commenced early in January ; the rows were hilled with a disc hiller on 27th January. Two cultivations were given after hilling, and the crop presented a very clean appearance. The rainfall (2,147 points) was very satisfactory, and splendid growth was made on all the plots. The crop was harvested on 2nd July.

Treatment.	Yield per Acre.	Increase due to treatment.	Value of Increase.	Cost of Increase.	Net Gain.
	bus. lb.	bus. lb.	£ s. d.		£ s. d.
3 grains every 20 inches	74 24	8 19	3 6 8	8 lb. seed extra, 1s. 8d....	3 5 0
3 ,, 28 ,,	71 30	5 25	2 3 7	3½ lb. seed extra, 9d. ...	2 2 10
3 ,, 32 ,,	69 8	3 3	1 4 5	2 lb. seed extra, 5d. ...	1 4 0
3 ,, 40 ,,	66 5	.....	.....	.....	.....

In both the Leaming and the Improved Yellow Dent experiments the lowest rate of seeding gave the lowest yield. In the Dent the highest net gain per acre was obtained from the heaviest seeding—that is, 16 lb of seed per acre. In the Leaming, the highest net gain was obtained from the second heaviest seeding, namely, 9·3 lb. per acre.

Farmers' Experiment Plots.

Potato Experiments, 1919–20.

Cotta Walla—Crookwell District.

R. N. MAKIN, Inspector of Agriculture.

Through the enterprise of the Cotta Walla branch of the Agricultural Bureau, potato plots were last year established on the farms of the following three members :—

Plumb and Wray.
Howard Bros.
Geo. Butt.

At the present time much attention is being given to procuring varieties of some merit, as many of those extensively grown before the appearance of Irish blight have become almost a thing of the past, and many of the newer varieties have proved disappointing.

It is not to be expected that a variety will be found that will keep its character year after year without proper attention to seed selection ; and, further, in order to increase our average acre yield and produce better quality potatoes, more attention must be given to selecting seed from high-yielding plants in the paddock. Not only should those yielding well be selected, but also those showing character and resistance to disease.

The tests under review were all conducted on basalt country, typical of the older potato-growing soils of the Crookwell district. Mr. Butt's land had not been under the crop for some time, while Messrs. Plumb and Wray's ground was under the crop last year, and Messrs. Howard Bros. the year before.

The soil is of red colour, rather loose when well worked up, but inclined to set in dry weather. It is a soil that could largely be improved by the addition of vegetable matter, such as red clover, field peas, rye, rape, or some such green matter ploughed under before or at the time of planting. All plots were manured with superphosphate at the rate of 3 cwt. per acre, distributed along the rows at the time of planting.

The seed was chiefly secured in the district, and was sown at the rate of about 12 cwt. per acre, the sets being dropped by hand at about 20 inches in the rows and about 30 inches between the rows, at a depth from 4 to 6 inches. All plots were sown during November.

The weather conditions were good until the end of January, when a dry spell set in, but later good rain fell, and the result was the best average yields since experiments have been conducted in the district. The potato moth

grub accounted for a good many of some of the largest sized tubers, and decreased the yield in several cases. This pest is always more troublesome during dry weather spells; deeper ploughing generally serves as a preventive.

The outstanding feature of the past season's experiments is the fact that Factor, a potato comparatively new to the district and fast coming into favor, topped the yields on each experiment plot. It is a white-skinned potato of fairly even growth, and generally of good cooking quality. With careful selection of the seed the Crookwell growers should find this potato a very fine market variety.

Earl Manistee is likely to be largely grown as an early variety. It has much to recommend it, the table quality being of the best. It is a light pink-skinned variety; although not reckoned a high yielder, it can generally be depended upon under good cultivation to yield potatoes of very fine size, showing all the desirable points of good table potatoes.

POTATO Variety Trials.

Variety.	Plumb and Wray, Cotta Walla.				Howard Bros., Cotta Walla.				Geo. Butt, Cotta Walla.			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
Early Manistee	3	15	2	24	4	0	3	8	5	3	1	24
Carman No. 1	4	13	0	21	3	19	3	3	5	7	3	21
Satisfaction	4	0	2	4	2	19	0	16	4	15	0	13
Up-to-date	4	7	3	12	3	11	1	17	4	14	0	23
Magnum Bonum	5	14	0	12	2	12	2	25	4	2	1	9
Factor	5	17	0	16	5	4	3	14	6	0	0	11
Coronation	3	19	0	2	3	6	0	2	3	15	2	9
Brownell's Beauty		.....			3	15	2	16	4	13	0	20
Dalhousie	5	0	2	4		.....				.....		
Langworthy	3	16	2	14		.....				.....		
Victorian Carman	3	15	2	25		.....				.....		

A potato largely grown in the district is the old Magnum Bonum, known locally as "Old Whites." It is a white-skinned, very late-maturing potato, and highly resistant to most of the fungoid troubles, but it is showing signs of "running out," and growers are advised to use up-to-date methods of seed selection to prevent the loss of such a fine variety.

Up-to-date, another white-skinned variety, does very well in some parts of the district. Indeed, some farmers consider it the best.

Coronation, a mottled-skinned variety, has been very disappointing. In many cases germination has been poor, and an unusually large percentage of second growth appears in some crops, so it is not altogether recommended for growing in any quantity.

Satisfaction is too well known for any comment.

Carman No. 1, of which there were local and Victorian strains, is perhaps, likely in the future to be largely grown, and may possibly take the place of Up-to-date, as it does not, as a rule, run to second growth so much.

Dalhousie and Langworthy are two white-skinned varieties still in the experimental stage, there not being sufficient seed yet for any large areas.

The Brownell's Beauty under test was not altogether the old type, it now being a difficult matter to obtain seed of the original type.

In selecting varieties of potatoes suitable for the Crookwell district, one could safely mention Magnum Bonum, Factor, Early Manistee, and Carman No. 1, or Up-to-date. In all cases early preparation of the ground, artificial and green manuring, and, if possible, a rotation of crops will all help towards improvement in the potato crops.

Insects attacking Nut Kernels.

The species of insects most commonly met with in nut kernels such as almonds, peanuts, Barcelonas, walnuts, &c., are:—

1. Indian Meal Moth (*Plodia interpunctella*).
2. Rust Red Flour Beetle (*Tribolium ferrugineum*).
3. Saw-toothed Grain Beetle (*Silvanus surinamensis*).
4. The Cadelle Beetle (*Trogosita mauritanicus*).

The life history in all four species consists of four stages, namely, egg, larva or grub, pupa or chrysalis, and adult insect. The grubs on hatching from the eggs feed on the kernels, and when full grown transform to the pupal condition, from which they emerge as the adult insect.

All the damage done by the first-named of these four insects, and the greater part of that by the others is done during the grub stages of the insects. Shelled kernels, on account of their direct exposure to infestation, are always much more heavily infested than unshelled. In the former the adult insects usually lay their eggs directly on the kernels, but in the latter the eggs are laid externally on the shells, usually in the vicinity of the natural division between the two halves of the shells. Infestation most often occurs in storage, usually in the country of origin, but it may also occur by contact with other infested foodstuffs during transit.

Some varieties are more liable to attack than others, no doubt in accord with climatic and other conditions under which they are grown. Varieties with hard, thick, strongly and closely sealed shells are naturally less liable to attack than thin shelled and imperfectly sealed ones. Shelled kernels are always liable to heavy infestation.—T. McCarthy, Assistant Entomologist.

What Herd Improvement Might Do.

Many cows in Victoria yield 450 lb. of butter annually, while the average is only 175 lb. There are, unfortunately, very many cows producing less than 100 lb. per year. It would be quite an easy matter to increase the average yield to 250 lb. per cow by improved breeding and feeding. If this were done, the butter production of Victoria would be increased by 40,000,000 lb., having a value of nearly £5,000,000. The breeding of cows can be improved by using only pure-bred sires from profitable dairy stock, and every effort should be made to grow and conserve fodder so as to prolong the period of lactation and thus raise the average production as indicated.—R. Crowe, Export Superintendent, Victoria.

Varieties of Wheat Tested in New South Wales.

J. T. PRIDHAM, Plant Breeder.

THE accompanying list of varieties of wheat has been prepared in the hope that it will be of use to growers who are interested in the testing, in this State, of the many wheats grown in the different parts of the world. The table serves to show the great number of varieties that have been tried by the Department, and also in a measure the large amount of crossbreeding and selection that has been done. Seed of many of the varieties named is quite unprocurable, the Department having only grown them long enough to determine their possible utility for our purposes, but the record will serve, perhaps, to answer the questions that arise from time to time about little-known varieties.

The information in the column "districts for which suitable" is based on observations at the Department's experiment farms, and on reports from farmers. Some growers, perhaps, will not agree with the classification in regard to season of maturity, but the terms "early, midseason, and late" are used relatively to the chief wheat-growing area of the State. A wheat marked "E" (early), may be very early, and this is more or less indicated by the district where it is likely to thrive, as, for instance, "hot and dry;" or, a variety may be styled late, and if recommended for "cold districts only" it may be concluded that it will be very late when grown there.

Care and discrimination are necessary in the choice of varieties for any locality, and introduced kinds should be tried on small areas only. A variety is sometimes saddled with a defect that would not have appeared if the grain had been sown at the proper time. An early wheat, for instance, if sown too early, is sometimes blamed for becoming frosted, and a long season, late variety, if not given sufficient time to produce a crop, may be branded as unproductive.

Caution.—It should be understood that the list does not in any way recommend the varieties named. It merely gives general information for the benefit of farmers. For convenience, however, the names of those varieties that are recommended by the Department for various purposes are printed in black type.

Key.

SEASON.
- E = Early, to be sown late.
- M = Midseason, to be sown midseason.
- L = Late, to be sown early.

USE.
- H = Adapted for hay.
- G = ,, grain.
- HG = General purpose.
- F = Fodder — ensilage or green fodder.

CLASS.
- S = Soft or weak flour grain.
- M = Medium soft flour grain.
- H = Hard or strong flour grain.
- P = Grain suitable for pigs and poultry.
- D = Durum or macaroni grain.

Varieties of Wheat grown or tried in New South Wales, with short descriptive notes.

Variety.	Season.	Use.	Class.	Origin.	Districts for which suitable.	Defects.	Distinguishing characters and good points.
Algerian	M–L	F	D	North Africa	Coastal	Bearded; sparse stooler ...	Rust resistant.
Allora Spring	E	HG	S	California	Dry and hot inland...	Flour of inferior baking qualities.	Drought resistant; a brown ear with irregular tip beards, or very short awns to chaff.
Alpha	M	HG	S	West Australia (Steinwedel x King's Jubilee).	Main wheat belt ...	Rust liable	White, rather tapering ear.
Alpine	M	HG	S	Selection from Purple Straw...	,, ,, ...	.....	.....
American 8	M	HG	S	America...	,, ,, ...	Sometimes rather hard to thresh.	Brown; very tapering ear; tall straw.
American Prolific				= Steinwedel	,, ,,	.....	.....
Anvil	M	HG	S	South Australia (King's White x Roseworthy).	,, ,, ...	Shatters a little; straw medium strong.	White tapering ear; productive hay wheat.
Argentine				Like Barletta	.....	.....	.....
Australian Poulard ...	M	F	P	Egypt	Dry and hot	Rust liable	Large heads and grain; beards tend to drop when ripe.
Australian Red Lammas	L	HG	S	.....	New England ...	Rust liable; shatters somewhat.	Bald white tapering ears; red grain.
Australian Talavera ...	E	HG	S	Channel Islands	Central districts ...	Rather rust liable	White tapering ear; large white grain.
Avoca	M	HG	S	Mr. Lalor, Avoca, Victoria ...	Main wheat belt ...	,, ...	White tapering ear; productive hay wheat; tall straw.
Bald Medeah				= Huguenot	.....	.....	.....
Barletta	M	HG	M	Russia	Central districts ...	Bearded, but awns not coarse	Ear medium size; straw slender; grain red.
Baroota Wonder ...	E	H	S	Telowie, South Australia ...	Main wheat belt ...	Rather rust liable	Resembles Zealand, but tip bearded and ripens earlier.
Basil	M	HG	S	South Australia, Roseworthy College (Fan x Red Fife).	,, ,, ...	Straw rather brittle... ...	White tapering ear; grain pale red or brown.
Bayah	E M	HG	S	Department's crossbred (Fife-Talavera-Jonathan).	,, ,, ...	Rather rust liable	Brown ear; resembles Federation.
Bearded Gluyas... ...	E	HG	S	South Australia	,, ,, ...	Bearded; straw not very strong.	Light brown ear.
Beloturka	L	F	D	Russia	Coastal	Bearded	Rust resistant; scanty stooler; tall; practically solid straw; drought resistant.
Berrigan Champion				= Dart's Imperial	.....	.....	.....
Berthoud's Crossbred 73				= Alpha	.....	.....	.....
Billy Hughes	E	G	S	Mr. Rich, Wellington, Selection from Canberra.	Western	.....	White bald ear.
Blount's Lambrigg ...	L	HG	M	American variety, Department's selection.	Tablelands	Shatters; rather late ripening	Small white shotty grain; white bald ear.
Blue Stem				= Haynes' Blue Stem, also = Dart's Imperial.	.....	.....	.....
Bluey	...	...	...	= Dart's Imperial	.....	.....	.....
Bobs	M	HG	H	Department's crossbred (Blount's Lambrigg x barley)	Tablelands	Tends to shatter; straw somewhat weak.	Small shotty grain; white ear more tapering than Blount's Lambrigg.
Bomen	M	HG	S	Department's crossbred (French-Fife-Indian).	Riverina	Susceptible to frost... ...	White tapering ear; red grain; stiff straw.

VARIETIES of Wheat grown or tried—*continued.*

Variety.	Season.	Use.	Class.	Origin.	Districts for which suitable.	Defects.	Distinguishing characters and good points.
Boman	...	...	...	Corruption of Bomen	.....	.....	.....
Budd's Early	M	HG	S	South Australia	Main wheat belt and North-west.	Rust liable	Brown ear; general purpose wheat.
Bunge	E	HG	S	Selection by Mr. Quodling of Queensland from Department's crossbred.	North-west	Medium strong straw ...	White, bald, tapering ear; stands feeding off.
Bunge No. 1	...	...	...	= Bunge	.....	.....	.....
Bungowannah	...	...	...	= Ortlipp's Bungowannah ...	.....	.....	.....
Bunyip	E	HG	M	Department's crossbred (Rymer x Maffra).	Main wheat belt ...	Brittle straw...	Bold, white, tip-bearded ear, large plump grain.
Burbank...	L	HG	S	America = Jones' Winter Fife	None	Too late ripening	Bald white heads; heavy stooler.
Californian Club ...	E	G	S	California	Main wheat belt ...	....	Short clubbed ear; does not shatter; straw short; stands up well.
Caliph	E-M	HG	S	South Australia, Roseworthy College = (Marshall's No. 3 x King's Red).	,, ,, ...	Weak flour grain	White tapering ear; productive.
Canberra...	E	G	S	Department's crossbred (Federation x barley).	Main wheat belt, especially hot and dry.	Weak straw	Brown ear; very productive variety, even when sown late.
Carmichael's Eclipse ...	E	HG	S	Crystalbrook, South Australia	Main wheat belt ...	.....	Brown ear, usually slightly felted; good for hay.
Cedar	E	G	H	Department's crossbred (Fife-Indian).	,, ,, ...	Weak straw; only medium yield.	White ear; holds red-coloured grain well.
Chance Prolific	...	...	...	= Dart's Imperial	.....	.....	.....
Chant's Prolific	...	...	...	,, ,, ...	.....	.....	.....
Chili	...	...	...	= Californian Club, sometimes = Warren.	.....	.....	.....
Chul	E	G	M	Russia	Main wheat belt ...	Bearded; straw weak ...	Drought resistant; better for grain than hay; red grain.
Clarendon	E	HG	M-S	Department's crossbred (Bobs-Gluyas-Fife-Indian).	Hot dry districts and coast.	Straw medium strong when grown inland.	Bald white ear; rather sparse stooler; escapes rust.
Cleveland...	L	HG	M S	Department's crossbred ...	Central tablelands and coast.	Liable to frosting in New England.	Rather rust resistant; large tapering white ear; tall straw.
Club Head	...	...	...	= Californian Club	.....	.....	.....
College Eclipse	E	HG	S	South Australia, Selection from Carmichael's Eclipse.	Main wheat belt ...	.....	Bald brown ear.
College Hunter	L	HG	S	New Zealand	None	Too late maturing	Heavy stooler.
College Purple	E	HG	S	Pye's crossbred, Victoria (Purple straw mostly).	Main wheat belt ...	Straw rather brittle when ripe.	White, tip-awned; clubbed ear; productive.
Comeback	E	HG	H	Department's crossbred (Fife-Indian).	,, ,, ...	Medium yielder; straw rather slender.	White tapering ear; rather small white grain.
Commonwealth	M	G	S	Pye's crossbred, Victoria (Jubilee-Talavera-Federation)	,, ,, ...	Too rust liable	Brown ear; short straw.
Coronation	M	HG	M S	.....	,, ,, ...	.....	Resembles Comeback, but grain softer.
Correll's No. 8	E-M	HG	S	West Australia (Medeah x Purple straw).	,, ,, ...	Medium yielder	Ears white, speckled with black; holds grain well.
Cowra No. 15	M	G	M	Department's crossbred, complicated pedigree.	,, ,, ...	Medium to good yielder ...	Dense white ear; short straw; well adapted for stripping.

VARIETIES of Wheat grown or tried *continued.*

Variety.	Season.	Use.	Class.	Origin.	Districts for which suitable.	Defects.	Distinguishing characters and good points.
Cowra No. 10	E–M	G	S	Department's crossbred (Redskin x Yandilla).	Main wheat belt	Straw medium strong	White, rather clubbed ear; dense.
Cowra No. 24	E	G	H	Department's crossbred (Yandilla King x Indian).	" "	Straw rather weak	Brown ear; strong tip-awn; short straw.
Cretan	L	F	D	South Europe or Russia	Coastal	Bearded; sparse stooler	Rust resistant; resembles Beloturka.
Crossbred 67				= Alpha			
Cumberland	E–M	HG	S	Department's crossbred (same bregding as Comeback).	Main wheat belt	Rust liable, like Purple Straw.	White tip-bearded ear; Purple Straw type.
Currawa	M	HG	S	Pye's crossbred, Victoria (Northern Champion-Cretan-Club).	" "	Straw rather rotten when ripe.	White-clubbed ear; productive; straw rather short.
Dart's Imperial	M	HG	S	Selection by Mr. Dart, South Australia.	" "	Rust liable; somewhat weak flour.	Drought resistant; does not shatter; tall strong straw; good general purpose wheat.
Dart's Improved	L	HG	S	Marshall's crossbred, South Australia (Jonathan x Dart's Imperial).	Riverina	Not so prolific as Marshall's No. 3.	Compact, white, bald ear; fairly good hay wheat.
Dawson's Golden Chaff	L	HG	S	America	None	Too rust liable	Brown ear; slightly clubbed or full tipped.
Defiance	L	HG	M	America (Prof. Blount)	Tablelands	Rather too late maturing	Grain and ear resemble Blount's Lambrigg.
Dreadnought	L	G	S	England	Only coldest districts	Too late maturing	Dense, broad, bald ear; red grain.
Droophead	E	HG	S	Erroneously Droophead Federation. A selection probably from Budd's Early.	North-west and Main wheat belt.	Grain yields a poor coloured flour.	Brown, nodding, tapering ear; productive.
Dumpty	L	HG	S	Apparently selection from Farmers' Friend.	Riverina	Matures too late	White, uniform, tip-awned, slightly tapering ear.
Durum				= Macaroni variety			
Du Toits	M	HG	S	South Africa	Main wheat belt	Weak straw; grain of poor quality.	White, tapering, tip-awned ear; rather small starchy grain.
Early Baart	E	HG	S	South Africa	" "	Straw rather weak	Hardy; white bearded ears; beards of unequal length; large grain.
Early Blue				= Droophead			
Early Bud				= Budd's Early			
Early Goldsmith				= Alpha			
Early Haynes' Blue Stem.	M	H	S	Department's crossbred (Haynes' Blue Stem x Indian)	New England		White ear with slightly felted chaff; grain pale red.
Ecksteen	E	G	S	South Africa	Main wheat belt	Straw weak	White bearded ear; productive; large white grain.
Eclipse	E	G	S	Dubbo district	" "	Rather short for hay	Brown tapering ear; slightly felted chaff.
Egyptian				= Mummy			
Emmer	L	F	P	Central Europe	Cold, poor soil	Too late for grain as a rule, and too hard to thresh.	Suited for grazing; heavy stooler with narrow foliage and slender straw.
Excelsior				= Petatz' Surprise			
Farmers' Friend	M	HG	S	One of the old Purple Straws	Main wheat districts	Too rust liable	White, tip-awned, slightly nodding ear.
Farrer's Drought Resistant.				= Yandilla King			

Varieties of Wheat grown or tried—*continued.*

Variety.	Season.	Use.	Class.	Origin.	Districts for which suitable.	Defects.	Distinguishing characters and good points.
Farrer's Durum ...	...	...	...	Similar to Beloturka	.....	.....	.....
Federation ...	M	G	S	Department's crossbred (Fife-Indian-Purple Straw).	Main wheat districts	Liable to rust and diseases generally.	Brown ear; very productive; short straw.
Field Marshall ...	M	HG	S	One of Marshall's crossbreds, South Australia.	,, ,, ,,	.....	White, rather long, slightly tip-bearded, medium erect ear.
Fife	...	...	...	= Manitoba	.....	.....	.....
Firbank	E	H	S	Department's crossbred (Zealand x Maffra).	Main wheat belt and Western Division.	Somewhat liable to loose smut.	Ears sharply tapering; white, lax and beardless.
Florence	E	HG	M	Department's crossbred (White Naples-Fife).	Dry inland and coastal.	Tends to shatter; straw medium strong.	White tapering ears; highly rust resistant.
Frame's Early ...	M	HG	S	Mount Barker, South Australia	.....	.....	.....
Frampton ...	L	H	S	= Port MacDonnell, South Australia.	Riverina	Rather late ripening ...	Long tapering white ears.
Fretes	E	HG	S	Algeria	Main wheat belt ...	Bearded; weak straw ...	White, tip-bearded heads.
Fultz	L	HG	S	America...	None	Too late ripening	Tip-bearded ear; heavy stooler; red grain.
Galland's Hybrid ...	L	H	P	France	None	,, ...	Large bearded ears; hunch-backed large grain; beards deciduous.
Gamma	...	...	...	= Budd's Early, a selection from South Australia.	.....	.....	.....
Genoa	L	HG	M	Same pedigree as Florence; Department's crossbred.	New England ...	Medium prolific	Similar in appearance to Florence, but much later ripening.
Giant Rye	...	...	...	= Polish wheat	.....	.....	.....
Gluyas' Early	E	G	S	South Australia; probably originated from India.	Main wheat belt and hot, dry districts.	Rather apt to lodge ...	Brown ear; rather short slender straw; very productive; drought resistant.
Gold Drop	...	...	...	= Gluyas' Early	.....	.....	.....
Golden Drop	E	H	S	South Australia	Main wheat belt and hot, dry districts.	Straw somewhat weak ...	White, fairly tapering, tip-awned ear; prolific.
Golden King	E	HG	S	South Australia	,, ,, ...	Rust liable	Brown tip-bearded ear.
Gregson's	...	...	...	= Lotz...	.....	.....	.....
Gresley	E	H	S	Mr. Grasby, West Australia (Federation x Huguenot).	Main wheat belt and hot, dry districts.	.....	Long white tapering ear; tall straw.
Hard Federation ...	E	HG	M	Natural crossbred from Federation; Department's selection.	,, ,, ...	Somewhat disease liable ...	Brown ear; rather less dense than Federation and straw slightly taller; good all-round wheat; stands feeding off.
Harriet	E	G	S–M	Mr. Farrell, Trundle-rd., Parkes (Comeback x Federation).	,, ,, ...	.....	Brown erect bald ear; rather short straw.
Haynes' Blue Stem ...	L	HG	S	America...	New England ...	Shatters readily; straw not very strong.	Tapering white-felted ears; tall straw; and red grain.
Hermitage	E	HG	S	Hermitage State Farm, Queensland.	,, ...	.....	White, bald, tapering ears.
Hudson's Early Purple Straw.	E–M	HG	S	One of the old Purple Straw group.	Main wheat belt ...	Rather rust liable; sometimes shatters.	White, uniform, tip-bearded ear; productive.
Huguenot	L	FH	D	Natural crossbred from Medeah; Mr. Correll, Arthur River, West Australia.	Coastal	Very sparse stooler; grain unsuitable for milling.	Bald heads; tall, practically solid straw; rust resistant; valued for hay by some, very palatable to stock.

Varieties of Wheat grown or tried—*continued.*

Variety.	Season.	Use.	Class.	Origin.	Districts for which suitable.	Defects.	Distinguishing characters and good points.
Hunter's White	L	HG	S	New Zealand	None	Too late maturing	White ear, tapering; red grain.
Huron	L	HG	S	Canada (Ladoga x Fife)	Cooler districts	Bearded; late ripening	Pale-brown ears; tall straw; stools well.
Imperial				= Dart's Imperial			
Improved Steinwedel	E–M	H	S	Pye's crossbred (Steinwedel-Purple Straw).	Main wheat belt	Tends to shatter somewhat; rust liable.	Resembles Steinwedel, but the spikelets are not quite so widely spread.
Indian Blue	M	HG	S	South Australia = Indian Red			Brown ear; like Budd's Early, but chaff shorter.
Indian Red				= Indian Blue			
Indian Runner				= Medeah			
Jade	E–M	HG	S	Department's crossbred (Purple Straw x Early Baart).	Main wheat belt	Weak straw; rust liable	Large white, tip-bearded ears; grain large, white; productive.
John Brown	M	H	M	Department's crossbred (Fife-Talavera and others).	Coastal	Medium productive for grain	Brown tapering ears; tall straw; large grain with deep crease.
Jonathan	M	HG	H	Department's crossbred (Fife-Indian).	Tablelands	Medium yielder; hard to thresh.	White bald ears; small shotty grain.
Jubilee	M	HG	S	Victoria	Main wheat belt		White tapering ears; tall straw.
Jumbuck	M	HG	S	Department's crossbred (Fife-Tardent's Blue-Talavera).	" "	Rust liable; tends to shatter	White felted ears; large grain.
Kanred	L	HG	H	Selection from Russian; received from U.S. America.	?	Too late maturing; bearded	Grain red; medium to small size; fairly long.
Kharkov	L	HG	H	Russia. Also spelt Karkof; Karkov, Turkey.	?	Too late; bearded	Slender straw; grain red, medium to small.
King's Early	E	HG	S	South Africa; selection from Early Baart.	Main wheat belt	Bearded; straw rather weak	Semi-solid straw; productive; does not shatter.
King's Red				Selection (South Australia) from King's Early.	" "	" "	Like King's Early except that grain is red.
King's White or King's Early White.				" "	" "	" "	Resembles King's Early.
Kitchener	L	HG	H	Canada; selection from Marquis.	Cold districts		Bald tapering ear; grain like Marquis.
Knockout				= Dart's Imperial			
Kubanka	L	GF	D	Russia	Coast for fodder; Main wheat belt for grain.	Bearded; sparse stooler	Makes the best bread in the world if grain is well-conditioned in mill.
Leatherhead	L	HG	S	South Australia; Farmers' selection.	Main wheat belt	Rather rust liable	White tapering ear; tall white straw.
Le Huguenot				= Huguenot			
Limberg's Velvet				= Tardent's Blue			
Lott's or Lotz	M	HG	S	West Australia; = Gregson's	Main wheat belt	Rather rust liable	Closely resembles Dart's Imperial.
Majestic	M	HG	S	South Australia; Marshall's crossbred.	" "		Tapering, white ear; dark yellow grain.
Major	L	HG	S	Pye's crossbred (Federation x Wallace).	North-west and Riverina.	Somewhat rust liable	White heads; medium length with broad tip; straw strong and stout.
Mammoth Rye				= Polish			
Manitoba	L	HG	H	Galicia, Central Europe. General name for Fife group.	Coldest districts	Straw rather apt to lodge; tends to shatter.	Tapering white, bald ears; small shotty grain, usually red.

VARIETIES of Wheat grown or tried—*continued.*

Variety.	Season.	Use.	Class.	Origin.	Districts for which suitable.	Defects.	Distinguishing characters and good points.
Marquis	L	HG	H	Canada (Fife-Indian)	Coldest districts ...	Straw slender	Heads and grain like Manitoba, but rather earlier and holds grain better.
Marshall's No. 3 ...	M	HG	S	South Australia; Marshall's crossbred.	Main wheat belt ...	.....	Not rust liable; serviceable general purpose variety.
Marshall's Prolific ...	M	HG	S	,, ,, ...	,, ,, ...	.....	Nodding, white, slightly tip-bearded ear.
Marvel	...	...	...	= Red Marvel...	.....	.....	.....
Marster's Perfection ...	...	...	...	= Perfection	.....	.....	.....
Medeah	L	F	D	North Africa	Coastal	Strong beards; sparse stooler	Smut, rust, and drought resistant; like macaroni wheats generally.
Minister	M	HG	M	Pye's crossbred (Dart's Imperial-Fife-Indian).	Main wheat belt ...	.....	White clubbed ear; straw rather short.
Moira	M	HG	S	Pye's crossbred (Purple Straw-Fife-Indian).	,, ,, ...	Somewhat rust liable ...	Ear clubbed at tip; typical Purple Straw variety.
Mountain Blue	...	...	...	= Dart's Imperial	.....	.....	.....
Mummy	L	F	P	Europe; also known as Egyptian, Alaska, Branched, Miracle.	Main wheat belt ...	Not suited for bread-making	Ear often has branched spikelets; large hunchbacked grain.
Nash's	E-M	HG	S	Farmers' selection from Parkes district = Velvet Top.	,, ,, ...	.....	White, felted, bald, nodding ear.
New England Champion	L	HG	S	Tamworth district	North-west	Rather too late	Long, tapering, white, tip-bearded ear.
Newman's Early ...	E	HG	S	South Australia; farmers' selection.	Riverina	.....	Rather large, tapering white, tip-bearded ear; large yellow grain.
New Zealand Velvet ...	E-M	HG	S	Tamworth district	North-west	Foliage rather pale-green for hay.	Felted, white, bald ears.
Nobby	...	...	...	= Californian Club	.....	.....	.....
Nonpariel	M-L	H	S	South Australia	Cooler districts ...	.....	Slender, white, tapering ears; straw tall, not coarse.
Odessa	L	H	S	South Australia	,, ...	Rust liable; flaggy... ...	Tapering, white, thin ears; tall straw.
Oregon	...	...	...	= Californian Club.	.....	.....	.....
Ortlipp's Bungowannah	L	H	S	Albury district; farmers' selection by Mr. Ortlipp.	Riverina	Straw purple...	White, long, tapering, tip-bearded heads; tall straw.
Penguin Island... ...	...	...	...	= Gluyas Early	.....	.....	.....
Penny	M	HG	S	Victoria; farmers' selection ...	Main wheat belt ...	Somewhat rust liable ...	Typical Dart's Imperial ear; good hay wheat.
Pennyroyal	E-M	HG	S	Wagga; farmers' selection ...	Riverina	.....	Rather like Dart's Imperial.
Penny's Squarehead ...	...	...	...	= Dart's Imperial	.....	.....	.....
Perfection	L	F	P	Europe; = Marster's Perfection.	Main wheat belt ...	Too late maturing; bearded	Beards drop off mostly when ripe; large humpbacked grain ; tall straw.
Petatz' Surprise ...	E	HG	S	South Australia; farmers' selection.	,, ,, ...	Straw somewhat weak ...	White, tapering ear; remarkable for high bushel weight of grain.
Phillis' Marvel	M	HG	S	South Australia; related to Ward's Prolific.	,, ,, ...	.....	Long ear; large grain; good for hay.
Pioneer	E	HG	M	... ?	Hot dry districts ...	Medium yielder	White, tip-bearded, tapering ear.
Pioneer Purple	...	...	...	= Smart's Early	.....	.....	.....
Plover	M	HG	S	Department's crossbred (Yeoman x Purple Straw).	Main wheat belt ...	Somewhat rust liable ...	Large, white, tapering ears; tall stout straw; general purpose wheat.
Plowman's No. 3 ...	E	HG	S	Selection by Mr. Plowman, Goonumbla.	Hot dry districts ...	.....	Dark brown ears; stout tall straw; good early hay.

Varieties of Wheat grown or tried—*continued.*

Variety.	Season.	Use.	Class.	Origin.	Districts for which suitable.	Defects.	Distinguishing characters and good points.
Polish	M	F	H	Europe; = Mammoth Rye ...	Main wheat belt ...	Sparse stooler; unsuitable for bread.	Very large loose ears; solid straw; extremely large grain.
Port MacDonnell ...	...	...	...	= Frampton	.....	.....	.....
Power's Fife	...	...	...	= Manitoba	.....	.....	.....
Prelude	E	G	M-S	Canada (Indian crossbred) ...	Main wheat belt ...	Bearded; short, rather weak straw.	White, rather small ear; red grain.
Pride of the West ...	...	...	...	Quirindi; resembles Blount's Lambrigg	.....	.....	.....
Propo	M	HG	S	California	Main wheat belt ...	Bearded; rust liable ...	White tapering ear; large grain.
Pugh's Rust Resistant...	...	...	...	= Allora Spring	.....	.....	.....
Purple Straw	M	HG	S	Probably from England ...	Main wheat belt ...	Rather rust liable	Slightly clubbed-tip to ear (not always); grain yellow and of good size.
Purple Straw Tuscan ...	M	HG	S	... ?	,, ,, ...	.....	White, tip-bearded, tapering ear; tall, purple straw.
Pusa	E	G	M H	Indian Department of Agriculture; a number of varieties issued under numbers.	Main wheat and hot dry districts.	Weak straw as a rule ...	Ears often bearded; hold their grain, which is hard; straw slender and short.
Queen Fan	M	HG	S	South Australia (Fan x Carmichael's Eclipse).	Main wheat belt ...	.....	White, uniform, tip-bearded ear, with spreading spikelets and stout straw.
Queen's Jubilee ...	E	HG	S	Victoria...	,, ,, ...	Rust liable	Large, white, tip-bearded, tapering ear.
Rattling Jack	M	HG	S	One of Purple Straw group ...	,, ,, ...	More rust liable than the average Purple Straw.	Dense clubbed ear; straw rather short and stout; grain yellow.
Rattling Tom	...	...	...	Similar to Rattling Jack ...	.....	.....	.....
Red Bobs	L	HG	H	Canada; natural crossbred from crop of Bobs.	Cool districts ...	Tends to shatter; straw medium strong.	Resembles Bobs when growing; but grain is red.
Red Fife...	...	...	...	= Manitoba	.....	.....	.....
Red Glyndon	...	...	...	,, ...	.....	.....	.....
Red Lammas	L	HG	S	New England	North-west	Shatters somewhat	Nodding, white, tapering ear; red grain.
Red Marvel	L	HG	S	England...	None	Too late maturing	Dense broad ear; stout straw; red grain.
Red Rock	L	HG	M	U.S. America	,, ...	Too late; bearded	Tapering white ears; red grain.
Red Russian	L	HG	S	Marshall's crossbred (Russian x Australian variety).	Main wheat belt—cooler parts.	Rather late ripening ...	Pale brown bald heads; red grain.
Red Straw	M	HG	S	One of Purple Straw group ...	Main wheat belt ...	Rust liable	Straw not quite so coarse as Purple Straw and therefore, better for hay.
Red Tuscan	M L	H	S	.....	,, ,, ...	.....	Tip-bearded, white, tapering ears; red grain.
Red Wing	E	G	M	Wellington; selection by Mr. Rich, from Canberra.	,, ,, ...	Straw rather brittle... ...	Brown bald ear; white grain.
Rieti	L	HG	S	Italy	Coastal	Slightly bearded; rather too late.	Very rust resistant; large grain.
Roseworthy	M	HG	S	Roseworthy College, South Australia.	Main wheat belt ...	.....	Resembles Marshall's No. 3, but straw not purple; and grain more plump.
Ruby	M	HG	H	Canada (Fife-Indian)	... ?	Straw rather weak	Bald ears; red grain.
Rymer	M L	HG	S	Department's crossbred (Fife-Purple Straw).	Main wheat belt ...	Straw inclined to be weak ...	White, tapering, ears; straw white, slender.
Sailor's Fortune... ...	...	...	...	= Droophead	.....	.....	.....
Sailor's Wonder... ...	...	...	...	Apparently = Droophead ...	.....	.....	.....

VARIETIES of Wheat grown or tried—*continued.*

Variety	Season.	Use.	Class.	Origin.	Districts for which suitable.	Defects.	Distinguishing characters and good points.
Salter's Hard Federation	...	...	...	Mr. E. E. Salter, Wellington; selected strain.	.....	.....	.....
Sanger's Prolific ...	M	HG	S	Selection by Mr. Sanger, of Wendouree, Coolamon.	Main wheat belt ...	.....	Resembles Dart's Imperial closely.
Scaddan's Glory ...	...	...	...	= Baroota Wonder	.....	.....	.....
Schmidt's No. 1 ...	M	G	S	Selection by Mr. Schmidt, of Walla Walla.	Main wheat belt ...	Rust liable	Brown clubbed ear; a variation from Federation.
Schneider	E–M	HG	S	Department's crossbred (Purple Straw).	,, ,, ...	Rust liable; tends to shatter	Drought resistant; ears rather like Steinwedel.
Schultz	M	HG	S	Mr. Schultz, Henty	,, ,, ...	.....	Rather tapering, white, tip-bearded ears; perhaps better for hay than grain.
Schultz' Purple Straw ..	M	HG	S	Mr. Schultz, Sheep Hills, Victoria.	,, ,, ...	Somewhat rust liable ...	Ear white, nodding, tip-bearded, fairly compact.
Sensation or Sutton's Sensation.	L	HG	M	France and England	Cold districts only ...	Usually ripens too late ...	Ear resembles Cleveland, but the grain is red.
Sheriff's Squarehead ...	...	...	...	= Lotz...	.....	.....	.....
Silver Baart	E	HG	S	South Africa	Main wheat belt ...	Straw not very strong ...	White, slightly nodding, tip-bearded ears; does not shatter; not rust liable.
Silver King	M	HG	S	Selection from Marshall's No. 3	,, ,, ...	.....	Resembles Marshall's No. 3, but straw is not purple.
Silver Star	...	...	...	Albury district...	.....	.....	.....
Smart's Early	M	HG	S	.....	Main wheat belt ...	Flaggy hay wheat, somewhat rust liable.	White, tip-bearded, uniform ear; strong purple straw.
Smut Proof	...	...	...	= Florence in South Australia.	.....	.....	.....
Sonora	E–M	HG	S	California	Main wheat belt ...	Pale green foliage, not prime for hay.	Brown, felted, bald ears.
Spelt	L	F	S	Cold poor soils of Europe ...	Coldest districts ...	Very hard to thresh, rust liable.	Bearded, very slender tapering ears, sometimes bald; only suitable for grazing or soiling.
Squarehead	...	...	...	= Dart's Imperial	.....	.....	.....
Steinwedel	E	H	S	South Australia; farmers' selection.	Main wheat belt ...	Shatters badly; quite rust liable.	Large, full, white, tip-bearded ears; heavy yielder.
Stockton Defiance ...	...	...	...	Closely resembles Early Baart	.....	.....	.....
Sullivan's Early Prolific	...	...	...	= Steinwedel	.....	.....	.....
Sunset	E	HG	S	Department's crossbred (Blount's Lambrigg-Fife-Club).	Hot dry districts ...	Sparse stooler	Drought escaping; earliest wheat grown; white, tapering, bald ear.
Sussex	L	H	S	Department's crossbred (Fife Essex x Tuscan Essex).	Coolsouthern districts	Somewhat rust liable ...	Long, tapering, white ear; tall straw.
Sutton's Special Mixture	...	...	...	= Baroota Wonder	.....	.....	.....
Suttor's Prolific... ...	...	...	...	= Dart's Imperial	.....	.....	.....
Tardent's Blue ...	L	H	S	Mr. Tardent of Queensland, who got it from South Russia.	Central Tablelands ...	.....	Felted, white, bald ear; tall straw.
Tarragon...	L	HG	S	Department's crossbred (Fife x Tardent's Blue).	,, ...	Straw medium stout ...	Tapering, white, tip-bearded ear; same season as Cleveland.
Teakle's Red	M	HG	S	Mr. Teakle, Isseka, West Australia.	Riverina	.....	Rather nodding, brown, tip-bearded ear; stems better for hay than grain.

VARIETIES of Wheat grown or tried—*continued.*

Variety.	Season.	Use.	Class.	Origin.	Districts for which suitable.	Defects.	Distinguishing characters and good points.
Thew	E	HG	S	Department's crossbred (complicated pedigree).	Coastal	Straw rather slender ...	Ear resembles Comeback; rust escaping.
Tiger	M	HG	S	Goonumbla,; farmers' selection.	Main wheat belt ...	Too rust liable	Tip-bearded, slightly clubbed ear.
Town and Country				= Blount's Lambrigg ...	.....	.....	.....
Triumph...	E-M	HG	S	Marshall's crossbred (Silver King x Ranjit).	Main wheat belt ...	Straw sometimes brittle ...	Rather nodding tip-bearded, white ear, tall straw; good for hay.
Turkey or Turkey Red...				= Kharkov.	.....	.....	.....
Turvey	M	HG	S	Victoria; sometimes Turvey's Purple Straw.	Main wheat belt ...	Straw brittle when ripe and lodges sometimes.	Nodding, tip-bearded, white ear; better for hay than grain.
Velvet Top	...	...	...	= Nash's	.....	.....	.....
Viking or Early Viking...	...	...	...	Resembles Gluyas; farmer's selection from South Australia.	.....	.....	.....
Walker's Wonder	...	...	...	= Droophead	.....	.....	.....
Wallace	M	HG	S	Pye's crossbred (Fife-Indian-Purple Straw).	Main wheat belt ...	Rather rust liable	Large clubbed-tip ear, white, tip-bearded; straw shorter than College Purple.
Walmer	E	HG	S	Mr. Farrell of Parkes (Federation x Steinwedel).	,, ,, ...	,, ,, ...	Brown, uniform, tip-bearded ear; does not shatter.
Warden	M	H	S	Pye's crossbred (Cross on Ward's White.	,, ,, ...	.....	White, tapering, bald ears; red grain; tall, good quality straw; prime for hay.
Ward's Prolific... ...	M	HG	S	Mr. Ward's selection, Nelsbaby, South Australia.	,, ,, ...	Grain yields a flour of poor quality.	Brown, bald, tapering ears; fairly rust resistant.
Warren	E-M	HG	S	Department's crossbred (Warner x Bobs x Jonathan).	Coastal and Central West.	Straw not very strong ...	White, bald, tapering ear; rust resistant.
Western Wonder	...	...	...	= Lotz...	.....	.....	.....
White Essex	...	...	...	Resembles White Lammas ...	.....	.....	.....
White Hogan	...	...	...	,, ,, ...	.....	.....	.....
White Lammas... ...	L	H	S	England...	New England, Central and Southern Tablelands.	Rather rust liable and lodges on rich soils.	Tapering, white, bald ear; large white grain; tall straw, good for hay.
White Tuscan	M	HG	S	.....	Main wheat belt ...	Rather leafy...	White tip-bearded ear; rather tall straw; a very fair hay wheat.
White Velvet	M	HG	S	Probably California	,, ,, ...	Pale green foliage, not very suitable for hay.	Bald, white, felted ears.
Wilfred	E	HG	S-M	Mr. Grasby, West Australia (Alpha x Federation).	,, ,, ...	Rather less productive than Hard Federation.	Like Hard Federation, but slightly less rust liable; blunt tip to ear.
Wilkinson's Early Prolific.	...	...	...	= Gluyas' Early	.....	.....	.....
World's Champion	...	...	...	= Lotz...	.....	.....	.....
World's Wonder ...	E-M	HG	S	.....	Main wheat belt ...	.....	Ear rather like Dart's Imperial; straw stout, medium height.
Yandilla	E	G	S-M	Department's crossbred (Fife-Indian).	Dry, hot districts ...	Short straw for hay... ...	Ears white, bald, medium size, clubbed tip.
Yandilla King	M	HG	S	Marshall's crossbred (Yandilla x Silver King).	Main wheat belt ...	.....	Like Marshall's No. 3 in the field; straw rather shorter and not purple.
Zealand	L	H	S	France	Riverina	.....	Long white, bald, tapering ears; tall straw, large white grain.

Decline in British Sheep-breeding.

At the international conference held at Darlington, England, by the (British) National Sheep-breeders' Association on 28th June, a paper read by Sir Henry Rew dealt with the subject of the decline in British sheep-breeding, in respect to which he gave statistical facts, and discussed certain economic tendencies. Concerning the reduction in the number of sheep in Great Britain, Sir Henry pointed out that the official agricultural returns (collected annually in June) are the only source of information, but they show the number over a period of fifty years. This period he divided into quinquennial sections, and the total stock of sheep in each such five-yearly period he found to be:—

Period.	Number of Sheep.	Period.	Number of Sheep.
1870–1874 ...	28,600,000	1895–1899 ...	26,000,000
1875–1879 ...	28,400,000	1900–1904 ...	25,900,000
1880–1884 ...	25,300,000	1905–1909 ...	26,300,000
1885–1889 ...	25,800,000	1910–1914 ...	25,400,000
1890–1894 ...	27,600,000	1915–1919 ...	23,700,000

From the above, leaving out the war period, it appears that "after the disasters of the early eighties the flocks of the country never recovered the position they held in the seventies," and "that during the present century they have fallen substantially below the standard of the nineties." Sir Henry referred to a disturbing element in connection with these comparisons, namely, the age at which sheep are now slaughtered: "Four-year-old wether, which used to represent the highest standard of mutton production, is now seldom seen at table. Early maturity has been adopted as a principle. It is evident that with the progressive adoption of this principle the number of sheep each year would decrease, even though the actual number bred were maintained."

Sir Henry Rew concluded: "If the importance of extending the arable area and increasing the production of cereals is recognised by the nation, it must also be recognised that one of the means which will assist in securing that end is to ensure that confidence is restored to the sheep-breeding interest, which has for generations been in a large degree the mainstay of British agriculture."

Lucerne as a Foodstuff.

Green lucerne is not only relished by horses, cattle, sheep, and swine, but it is specially adapted to their needs. When fed freely to young animals it promotes a large and vigorous growth. Along with suitable grain adjuncts, it will fatten animals quickly, and will give them a fine finish. With but a limited addition of carbonaceous food, swine may be raised upon it until ready for the block. Of course, during the fattening period, grain must be the chief reliance. But to no class of stockman is green lucerne of more benefit than to dairymen. It is excellent for milk production, and the long season during which it is accessible further accentuates its value.

Of course, in the green form, it should be fed with some restriction to horses at work, but for all other classes of horses it makes excellent food. It is also helpful when fed to fowls. Other things being equal, meat and milk cannot be produced anywhere more cheaply than in areas possessed of high adaptation for growing lucerne.—*South African Dairyman.*

"Khapra," an Indian Wheat Pest.

W. W. FROGGATT, F.L.S., Government Entomologist.

STATEMENTS have lately been made about the presence of the Indian insect pest "khapra" in New South Wales, and have been so widely reported that it seems advisable to place on record a few notes on the subject.

It has been said (1) that the Indian dermestid beetle, called the "khapra," has been found in wheat in Sydney, and (2) that Professor Lefroy in January, 1918, said he had discovered a worse pest than grain weevil in Australian wheat, and this was the khapra. The pest was found in the wheat stacked at Enfield.

As regards the first statement, it has to be said the insect that was seen in the samples of wheat at the Chemist's Branch of the Department of Agriculture was not the khapra, but that cosmopolitan grain beetle (also a native of India) which American entomologists have named the lesser grain borer (*Rhizopertha dominca*). This beetle was found in large numbers in the wheat stacked at Enfield in 1918, and was identified, figured, and described in the pages of the *Agricultural Gazette* in 1918. The writer, with Mr. T. McCarthy, and later on with Mr. A. M. Lea, of the Adelaide Museum, made a very careful biological survey of the wheat stacks at White Bay and Enfield, collecting and mounting every species of insect that was found infesting wheat. As a member of the Imperial Wheat Diseases Committee, the writer visited many of the stacks in different parts of the State, and also all those in the vicinity of Melbourne. No specimen of this Indian wheat pest was found in any of our stacks.

It is somewhat remarkable that Professor Lefroy, if he found this beetle in Sydney, did not announce his discovery, or at least notify Australian entomologists that they had another wheat pest to study and fight. No record can be found of Professor Lefroy having made such a discovery public. When working on the wheat pests three years ago, I obtained authentically named collections of stored grain pests from the Federal Bureau of Entomology at Washington, U.S.A., Mr. J. J. Walker, Oxford University Museum, England, and from the Entomological Department of the Imperial Department of Agriculture, Pusa, India. The only specimens of the khapra were those in the collection sent from India by Dr. Bainbridge Fletcher.

This beetle belongs to the family *Dermestidæ*, which includes a number of well-known pests in stored foods, such as the skin weevil (*Dermestes vulpinus*) and the bacon weevil (*Dermestes lardarius*).

In the earlier Indian reports the khapra was known under the name of *Æthriostoma undulata*; then it was placed in the genus *Attagenus* and became *Attagenus undulatus*. Later investigators concluded that its

proper place was in the genus *Trogoderma*, and decided that it was not even *undulatus*, so the specific name was dropped, and the popular name of khapra was attached to it; hence its scientific name as it now stands is *Trogoderma khapra*.

This beetle was first noted as a pest in India by Coates in *Indian Museum Notes* (vol. ii, 1893, p. 148) as *Æthriostoma undulata* Motsch. "A little brown beetle, with white, hairy grubs, known as khapra in the Delhi bazaar, where it is said sometimes to destroy as much as 6 or 7 per cent. of wheat stored in godowns."

In "Indian Insect Pests," 1906, Lefroy says (p. 252): "A dermestid (*Æthriostoma undulata*), closely allied to *Dermestis vulpinus*, is reported from India in wheat. This, or the last, is the insect found in grain in Gujarat, where it is believed to be of use in checking other grain insects, notably the red grain weevil. This belief is so firmly held that the dermestid is introduced in the grain infested with insects as a check on them."

In 1909 the same writer says, referring to this insect, "The part it plays in wheat is not ascertained, but it is likely to be predaceous upon other insects there, or to feed on their dead bodies."

In a memoir of the Agricultural Research Institute, Pusa, Messrs. Barnes and Grove, in "Insects attacking stored wheat in the Punjab, &c.," gave an exhaustive account of the life history of the khapra and lesser grain borer, with coloured plates. In conclusion they say, "Investigation has shown that this insect certainly does not play the role suggested by Lefroy in his later note, but is a very active agent in destroying the wheat."

Professor Lefroy may have altered his opinion since the above quotations were written, but so far as I can ascertain he does not appear to have published anything further on the subject.

Both these beetles are very interesting from an economic point of view, as the khapra belongs to a group of carnivorous beetles, which in the first instance found their way in the larval or perfect state into the stored grain to feed upon the original wheat-destroying insects, and, later on, probably through the absence of such food, turned their attention to the wheat grains and nibbled the surface until they adapted them as their food supplies and became wheat destroyers.

The lesser grain borer belongs to a family of wood-boring beetles, and originally feeding in the wood in which grain or stored foods were packed, made its way out into the contents, found it suitable food, and thus also became a grain pest, the beetle boring into the wheat grains and doing the greater part of the damage.

Their method of damaging the wheat is quite distinct. In the case of infestation by the khapra (*Trogoderma khapra*), the female beetle lays her eggs, averaging from thirty to forty-five in number, among the grains of wheat, the little hairy larvæ going through a series of moults, gnawing the outer surface of the wheat grains until full fed, when they crawl away and pupate in the last larval skin.

The adult beetle varies from brownish-black to reddish-brown in colour, not much longer than broad, rounded at both extremities, with a small head slightly turned downwards, fitting close against the prothorax, furnished with eleven jointed antennæ, the central ones smallest and the last three forming an irregular club, the whole surface of the thorax and wing covers clothed with fine reddish hairs. Length, 3 mm.

This beetle is most active in the hottest and driest part of the Indian summer (May, June, and July), when the wheat is dry and hard. There is reason to believe that under the different climatic conditions in Australia, where we never have such a dry heat as in Northern India, the khapra would not do as much damage as weevil, if it was to be accidentally introduced.

Flag Smut and its Control.

The spores of flag smut (the fine black dusty matter which is observable on crushing a leaf of an infected wheat plant) can reach the wheat grain in two ways:—

(1) Through the soil being well supplied with them,
(2) By adhering to the grain.

If the paddocks have not previously been badly infected with flag smut, then the pickling process, resorted to as a preventive of stinking smut, has also a cleansing value for flag smut. If, however, the paddock has been badly infected with flag smut the previous season, pickling has little or no effect. If possible a rotation crop should be sown to starve the fungus out. Normally the spore germinates about sowing time, when the conditions of moisture and temperature are favourable to it, so that if the young fungus does not then come into contact with a young wheat plant it dies. If wheat must follow wheat, then the land should be ploughed and worked as soon after the harvest as possible. The moisture conserved in this way may result in the germination of the flag smut prior to the sowing. The use of a late variety would then be an advantage.

If stubble from a badly affected crop is not burnt off, a large number of spores drop into the soil. Sowing in a dry seed-bed will usually favour the disease for the reason that, if it contains ungerminated spores, the spore and seed will lie together until rain comes, when they will germinate at the same time, giving the fungus every chance of surviving.

It is important also to note that horses and cattle fed on diseased hay have been shown to pass the spores uninjured and capable of germination. In this way flag smut may be spread from paddock to paddock.

It seems that approved good farming methods—rotation of crops, fallow, early preparation of the seed-bed, conservation of soil moisture, and pickling are our best methods of combating flag smut. A good burn of diseased stubble is also very important.—Chas. O. Hamblin, Assistant Biologist.

What could be done to fill up cracks in a concrete sheep-dip, was lately inquired. Filling with cement had been tried, but without success. The Overseer of Works suggested that the usual cause in such cases is the soakage of surface water getting behind the walls, in which circumstances the trouble might be relieved by cutting off the surface drainage.

"Improved Sires."

An "improved sires" movement is occupying attention in different parts of Canada, legislation, education and propaganda all being laid under tribute to bring under the notice of farmers the value of using better breeding stock. In the province of Nova Scotia a Scrub Bull Act was passed in 1919, providing that the owner of a scrub bull must not permit such an animal to serve any cow within certain limits except a cow owned by himself, and he must not permit it to wander from a properly fenced enclosure unless under the control of a competent attendant. In 1920 the scope of the Act was enlarged, and it is recorded in the *Agricultural Gazette of Canada* that "already there are evidences that this Act has accomplished considerable to drive out the scrub sire, and to establish the supremacy of the pure-bred sire."

In the province of Saskatchewan, the Government assists farmers to procure pure-bred sires, purchasing bulls for cash and selling them on terms. In 1913, 19 bulls were so distributed, in 1916 the number was 150, and in 1919 it reached 195.

Phalaris bulbosa and Chilian Clover at Dorrigo.

Mr. W. A. Parberry, Corridgeree, North Dorrigo, writes:—

Phalaris bulbosa was sown 22nd April and germinated well. It did not suffer from frost like the clovers. It is now partly in head and about 2 feet high. It appears to be a very good winter grass, keeping very green and succulent all through the heaviest frosts. I also sowed a little of this seed in stump ashes where cattle grazed all through the winter, and it did wonderfully well.

Chilian clover was sown at the same time. Frosts set it back severely, but it came away immediately the mild weather set in again. It is now 15 inches high with lovely foliage. I am exceedingly pleased with this clover. I sowed a little seed in burnt stump ashes, and the growth has been luxuriant and vigorous, despite the fact that cattle grazed on the field all the winter.

Canada's Outlay on Agriculture.

Agricultural experiment work and education are fully appreciated in Canada. The Dominion Parliament made appropriations totalling 4,366,000 dollars for the year 1920–21, as against 3,648,000 dollars for the previous year.

This does not take account, of course, of the amounts voted by the various provincial legislatures. In Ontario, the vote for 1920 was 1,594,500 dollars, as against 1,339,932 dollars in the previous year; the amount did not include 336,000 dollars granted by the Dominion Government. In Manitoba, the provincial vote for 1920–21 was 582,490 dollars, as against 476,605 dollars for 1919–20. In Alberta, apart from certain votes chargeable to capital, there was allocated for 1920–21, 602,745 dollars, as against 552,354 dollars for the previous year.

Farmers' Experiment Plots.

Maize Experiments, 1919–20.

Central Coast District.

J. M. Pitt, Assistant Inspector of Agriculture.

Maize trials were conducted with the undermentioned farmers during the season 1919–20 :—

A. H. Norris, Mount George, Manning River.
E. L. Andrews, Mount George, Manning River.
R. Richardson, Mondrook, Manning River.
W. H. Duffy, "Barham," Comboyne.
G. A. Andrews, Charity Creek, Manning River.
W. Smith, "Bona Vista," Paterson.
Alex. Smith and Atkins Bros., Bandon Grove, Dungog.

The season was a good one, and yields much above the average. The winter and early spring months were dry, and farmers took advantage of these conditions to prepare fields earlier than usual. This procedure had the dual effect of sweetening the soil and in many instances conserving portion of the heavy autumn rainfall. Dry conditions continued throughout the coast until late October, when a general break up of the drought took place. Excepting for a short dry period in December, the remainder of the season continued favourable.

Along the Macleay rain came in time to "crown" the plots sown early, and it is many years since such enormous yields have been harvested in that district. Some yields obtained by farmers along the Manning were records, those obtained in the competitions conducted by the Agricultural Society in that district being well over 100 bushels per acre.

The cultural methods adopted by the experimenters were on the whole sound, although one or two are still "out of line." The too constant use of the roller, and the leaving of a rolled surface from which moisture evaporates rapidly, and which rain quickly hardens, is a procedure not recommended. The use of the disc cultivator instead of the usual ploughing just prior to sowing, is a practice adopted by many of the successful growers ; it brings the plot into excellent tilth, only the surface few inches being worked. Further, the work can be done more expeditiously this way than by use of the plough. This applies chiefly to those areas kept in fairly good order during the winter and after the first ploughing, and not to those having a hard rolled surface ; these invariably require a ploughing.

A great many of the Macleay farmers rely on the growth and turning under of crops, such as field peas and vetches, to maintain the soil fertility. This is a sound method, but the application of small amounts of fertilisers, such as superphosphate, would also be highly beneficial.

Owing to the continued drought and scarcity of all classes of fodder in the "back" country, practically all the grain was despatched for starving stock. Record prices were obtained. The available figures for the rainfall were as follows:—Mount George: September, 108 points; October, 215; November, 199; December, 507; January, 729; February, 284; March, 202. Mondrook: September, 196 points; October, 114; November, 127; December, 155; January, 692; February, 264; March, 128. The yields obtained are shown in the following table:—

MAIZE Variety Yield.

Variety.	A. H. Norris, Mount George.	E. L. Andrews, Mount George.	W. Smith, Paterson.	*R. Richardson, Mondrook.	Alex. Smith, Bandon Grove.	W. H. Duffy, Comboyne.	G. A. Andrews, Charity Creek.
Date Sown.	11 Oct., 1919.	9 Oct., 1919.	27 Sept., 1919.	22 Oct., 1919.	13 Nov., 1919.	4 Nov., 1919.	29 Sept., 1919.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Improved Yellow Dent ...	85 11	63 37	..	81 14	112 14	...	71 0
Golden Nugget...	...	58 24	...	71 14	95 46	32 23	...
Yellow Horsetooth	...	...	...	...	107 31	...	90 0
Yellow Mastodon	...	...	...	71 28	..	...	...
Leaming	...	59 31	...	78 42	96 3	35 29	70 0
Leaming (farmer's seed) ...	...	...	..	...	...	41 5	...
Yellow Hogan	...	..	...	...	106 21	...	...
Red Hogan	...	72 44	...	74 28	...	...	...
Narrow Red Hogan	87 40	...	...	72 28	109 53	...	...
Silvermine	...	..	76 0	65 0	...	42 13	...
Manning White	...	...	...	91 14	....	...	...
Golden Beauty...	...	67 43	...	80 28	...	...	..
Golden Superb...	66 0	...	48 0	...	...	12 14	63 0
Kansas Sunflower	...	51 19	...	71 42	...	..	70 0
Palecap Horsetooth	...	...	...	77 42	...	...	...
Golden King	...	63 37	..	...	...	...	...
Golden Glow	...	...	49 0	...	...	...	...
Funk's Dent	78 28	...	75 0	...	...	...	...
Boone County White	...	...	...	73 42	...	...	...
Early Yellow Dent	...	...	49 0	...	...	...	...
Eureka	...	48 7	...	...	...	...	...
U.S. 133	45 5	...	33 0	...	...	20 7	...
Star Leaming	78 33	41 4	...	...	...	...	...
King of Earlies	...	...	...	...	...	48 31	...
Yellow Dent (farmer's seed)...	86 39	...	...	...	...	...	...
Small Red Hogan	...	43 7	...	...	...	14 13	...

*Fertiliser, 2 cwt. P7.

Of varieties grown, Improved Yellow Dent is still the most popular; its adaptability to all kinds of weather and soils places it in a class by itself. Its bright attractive grain also makes it one of the best for market. Other constant yielders were Yellow Horsetooth, Golden Nugget, Leaming, and Manning White. Of the earlier maturing varieties Funk's Yellow Dent gave good yields, and is fast becoming a popular variety for early sowing on the Manning. Golden Superb is still the most widely sown early variety for the

Macleay, farmers having it on the market usually in January. U.S. 133—a new very early variety—sown on 26th August, was pulled on 6th January (barely 4½ months later), and yielded nearly 60 bushels to the acre.

The season was not a bad one for fungus or insect pests. The Comboyne plots were, as usual, most affected, late blight greatly decreasing yields.

Green Manuring Experiment.

To demonstrate the value of green manuring, an experiment designed to extend over a number of years was commenced on the farm of Mr. E. L. Andrews, Mount George. Three plots were included in the experiment for the first season, these comprising—(1) a plot on which field peas were grown for turning under; (2) one on which barley and vetches were grown for that purpose; and (3) one on which, for purposes of comparison, the method customarily adopted by Mr. Andrews and neighbouring farmers was practised. This method consists of ploughing the land shortly after the removal of the previous maize crop (usually about the end of April or May) with a 28-inch disc single-furrow plough, all stalks, weed growth, &c., being turned well under. During the winter the fallowed land is sometimes worked to destroy weed growth and to keep the surface loose; then, before sowing, the field is again ploughed 4 to 6 inches deep.

This method of cultivation is sound, for it aims at moisture conservation and the sweetening of the soil, and is far preferable to the methods adopted by many farmers, which leave the field "dirty" until just prior to sowing.

Field peas were sown at 1 bushel to the acre, barley 1 bushel, and vetches 12 lb., on 13th May, 1920. Good growth eventuated on both the green manure plots. The three plots were ploughed on 1st October, rolled and harrowed, and maize was sown on 15th November.

Considering the dense mass of green manure turned under, the time allowed for its decomposition prior to the sowing of the plots to maize was hardly sufficient, and it was not surprising that the early growth of maize on the green manure plots was inferior and yellowish compared with the growth on the fallowed plot.

As the season advanced, however, the growth of maize on the field pea plot was in appearance superior to all the others. The maize on the barley and vetch plot, owing to the great bulk of the crop turned under (about 10 tons as against 6 tons of field peas), made poor headway throughout.

Nearly 11 bushels more grain per acre were harvested from the field pea plot than from that treated by the farmers' method, and 30½ bushels more than from the barley and vetch plot. The yields were as follows:—

	bus.	lb.
Plot No. 1. Green manured with field peas	77	0
Plot No. 2. Green manured with barley and tares ...	46	33
Plot No. 3. Farmers' plot	66	37

The results so far have proved interesting to the neighbouring farmers, many of whom grew field peas during the winter.

The Culture of Sugar Cane in New South Wales.

[Continued from Vol. XXXI, page 859.]

A. H. HAYWOOD, Manager, Wollongbar Experiment Farm.

The Burning of the Trash.

THE first operation that follows the harvesting of the cane is the burning of the trash. The dead and dying leaves that remain on the ground after the crop is cut and removed must run into several tons per acre, and it is impossible to avoid the regret that so much vegetable matter must be destroyed. Might it not be allowed to lie on the surface until it can be ploughed under, and thus returned as humus to the soil that produced it? The idea looks attractive, but the trash harbours much in the way of fungi and insects, and the practice would almost certainly be attended by an increase in the number of enemies with which the ratoon crop would have to compete. Where a stand is being ploughed out it might be permissible to allow the trash to remain on the surface and plough it under when breaking up the cane stools; but even there the practice has the obvious objection that if the land is to be replanted at once to cane, the young plants will have plenty of enemies waiting them in the soil. If some other crop, such as maize, or a renovating crop such as cowpeas, is to occupy the ground for a year before the land is replanted to cane, no doubt the interval would be sufficient for the spores of the fungi to be starved out, and in such cases the trash might be turned under with a measure of safety, but the practice cannot otherwise be commended.

One farmer on the Cudgen area, complaining that his land was becoming exhausted (after thirty years of cane-growing with practically no intermission), intimated his intention to let the trash lie on the ground; he thought perhaps the burning of the trash every couple of years was burning the fertility out of his land. What the result may be we have yet to see, but he certainly could adopt better methods of maintaining fertility and would find them no greater drawback than the loss of a season. As the variety with which he was making the experiment was Malabar—strong growing and hitherto fairly free from disease—the result may not be so bad, but at the best the method is a dangerous one.

Where the crop has been cut very early in the season, and there is danger that frost may catch the tender shoots of the following ratoon crop, it is better to let the trash lie on the surface until the risk of frost is past, for the young plant is exceedingly tender, but even this must be with the reservation that any fungi present will become busy at the first improvement of the weather, so that the firestick must be put in as early as possible.

Cultivating the Ratoon Crop.

The trash being thus disposed of, the farmer must set about the cultivation of the stools in view of the ratoon crop. In the sugar cane districts of New South Wales, farmers look to get at least two cuts of cane from a stand —one "plant" cane and one ratoon—but quite frequently the stand is good enough to yield three ratoon crops (or four cuts in all).

The first operation on behalf of the ratoon crop is a thorough deep ploughing between the drills to open up and aerate the soil, working close to the stools with some disc implement that will act as a root pruner. Distinct advantages lie in thoroughly opening up and exposing the stools to light and air for a short time. A good many farmers still prefer to plough on to the stools at this stage, but others among the most successful growers find that ploughing away from the plants cuts off the old roots that have fulfilled their function, and encourages the formation of a new and more vigorous root system on the sides. Thus invigorated, the stools have a firmer hold on the ground, and from the roots send up better canes than if the lower remaining nodes of the canes lately harvested are allowed to shoot again.

The methods of effecting this root pruning vary a great deal, a few carrying it out on all four sides, others doing it on three sides out of four, and others again two out of four sides, contenting themselves by "ploughing on" on the remaining sides. The implement used is generally a mouldboard plough with disc coulter attached.

Shaving the ratoon crop stubble just below the surface has a very stimulating effect on cane, but it is an operation that has so far been done by hand, and cane-growers are still awaiting the introduction of a horse-power implement to perform the work economically.

It is interesting to add that farmers have observed that where tram lines have been laid for the removal of the cane, those stools that have to be trimmed hard in levelling the track are often the best in the whole crop.

Where this root pruning does not form part of the farm practice, it is usual to give a thorough working. The after-cultivation in both methods is with the disc cultivators until the growth of the cane again puts an end to all such work.

A method of ratooning adopted at the Mackay Sugar Experiment Station in Queensland was lately referred to by the *Queensland Agricultural Journal* as giving large yields of ratoon crops. It is applicable to only a limited area of New South Wales, but it is perhaps worth quotation:—

"It is believed that the best method of securing large yields of ratoon cane is to adopt the following procedure:—Immediately the trash is burnt, open up the middles of the rows to a depth of 9 inches with the swing plough; next subsoil these two furrows so that a further depth of 6 inches is thoroughly stirred. Next plough away from the cane rows on to the middles and again follow with the subsoiler. By this means the whole of the ground between the rows has been moved and stirred to a depth of 15 inches;

and the benefit to the ratoons in thus breaking up the hard ground and letting in air and sunlight is difficult to over-estimate. Subsequent shallow cultivation with broad hoes should now be practised frequently.

"The results obtained at the Experiment Station, due to this method of cultivating ratoons, are detailed in the table below:—

Crops.	Ground between rows, ploughed and subsoiled.	Ground between rows ploughed to 8 inches.
	Yield in tons.	Yield in tons.
First Ratoon	38·9	27·0
Second Ratoon	31·3	19·2
Third Ratoon	20·4	9·91

"These experiments were not fertilised."

Rotation.

It is convenient before turning to discuss the varieties of sugar cane grown in this State, to say a few words on a subject to which allusion has been made several times in these articles, and to which we are assured farmers will be compelled as time goes on to devote more and more attention.

Rotation of crops lies at the very basis of good farming. In certain countries (chiefly countries where farming has been followed for many years) a systematic rotation is specifically prescribed in the mortgages and leases under which land is commonly held, so well do owners and tenants recognise it as an essential part of good husbandry. New land may yield profitably under one crop for a few years, but do so indefinitely it will not. Sooner or later a change becomes imperative.

Continuous cropping brings with it depletion of the vegetable matter in the soil and declining fertility, and it permits the invasion of diseases and pests that increase in the vigour of their attacks as the strength and virility of the crop declines. Postpone its effects in various ways we may attempt to do, and even with a measure of success, but deliver ourselves from this law of nature we cannot. Wheat farmers have learned it; so have maize farmers; Americans, with all their resourcefulness have not been able to avoid it; the patient farmers of civilisations thousands of years old have bowed to its dictates, and the cane-growers of our northern rivers cannot claim exemption.

We have already indicated that this is a phase of things not unknown on the Clarence, Richmond, and Tweed, but the theory—excellent thing that it is—has yet to be put into common practice. No doubt legumes are grown from time to time and ploughed in between two cane stands, but the complaint "that we do not get the yields we once did" has but one answer.

The cane-grower is in the fortunate position, too, that crops suitable for the purpose and capable of returning a reasonable profit without undue loss

of time, offer themselves. Maize, for instance, can be sown after the stools have been ploughed up, and harvested early enough to allow a short fallow before the next cane crop can be sown. We have indicated at an earlier stage, too, that many cane-growers have found that the land can be profitably sown with grasses and clovers, or even allowed to lapse into couch grass pasture and devoted to dairying for a few years. The effect is the renovation of the soil, and the starving out of fungi that have established themselves, and the crops of cane obtained when the land is returned to the main crop are instructive as well as profitable.

The possibilities of change of crop are thus considerable and should be attractive.

The Utility of Legumes.

It is opportune, however, to urge upon farmers the use of legumes more extensively. If the fertility of the soil is to be maintained under such conditions as sugar cane demands, it can only be by the growth of crops with the specific object of maintaining humus. How efficient legumes are for this purpose our growers of cane already well know. How little they make use of them we have already indicated. Yet, excellent legumes offer themselves for each of the rivers. On the Clarence and Richmond, for instance, cowpeas produce heavy crops of foliage, and of seed in summer, and vetches do well in the winter. On the volcanic soils of the Tweed, Florida velvet and Lablab beans make vigorous growth in summer, and vetches have proved their ability to make good growth in the winter. One farmer on the Clarence affirmed that if growers would make it their practice to take no more than two cane crops (the plant crop and one ratoon) from their land, and then sow cowpeas, they would do better than by following one cane crop close upon another. He advocated sowing early maize, thinly, about 8 lb. per acre, and then after the maize was up, sowing 7 or 8 lb. cowpeas per acre with the maize drill between the rows. The maize would be harvested in February, and the cowpeas and stalks then ploughed in. A month later field peas should be sown as a winter crop to be ploughed in in spring. This farmer went so far as to advocate two maize crops (with cowpeas) and two sowings of vetches before the land should be worked up for the sowing of cane again. No doubt it looks somewhat heavy, but he has been one of the most successful growers of cane on the Clarence, and knows the value of maintaining the fertility of his land.

But the combinations that suggest themselves for judicious associations with cane are quite numerous. What is necessary now is not their reiteration, but the practical application by farmers of the methods they all approve and acclaim, but too few adopt. The advantage is real. In Louisiana a crop of velvet beans, turned under in 1917, is credited with adding 25 per cent. to the cane grown on the same land the next year, and on the Clarence at least one farmer can testify that whereas his land had run down to crops of 10 tons per acre of ratoon cane, renovation with maize, cowpeas, and vetches successively was followed by crops of 60 tons of plant cane. It is the translation of our knowledge into habit that we want.

Manures and Fertilisers.

Fertilisers are not extensively used. Trials have been conducted by different farmers in their own ways, but properly arranged experiments are required before anything definite can be said. Appearances seem to indicate that provided the fertility of the land is well and properly maintained, the only utility of the fertilisers is in connection with the ratoon crop. Some farmers favour bonedust with a little blood added, others again have had fair results with a complete fertiliser, and yet others again have been well pleased with their experience of nitrate of soda. It can be said with some certainty that fertilisers are likely to be profitable when used on the green manure or rotation crops, and they should not be omitted when maize is sown.

(To be continued.)

A Case of Spring Dwindling.

"I have met a problem this spring that has me beaten," wrote an apiarist to the Department recently. "I have four colonies which did well over winter, but now the bees are lying dead quite thick in front of the hives. The comb seems quite good, and is filled with eggs and young bees, but there is very little honey, although the weather has been good. The bees appear to me to have been carrying on a wholesale slaughter among themselves for the past ten days. . . In one hive I think they are uncapping the young bees and killing them."

It is considered that the colonies are affected with spring dwindling, replied the Senior Apiary Inspector. This malady does not often cause the complete collapse of the colonies, although the population is often somewhat depleted. The cause of the trouble can usually be traced to some abnormal condition experienced during the previous autumn or winter months, such condition having lowered the vitality of the bees to such an extent that a large number are unable to resist the spring disease (probably caused by the parasite *Nosema apis*). In some cases the bees are simply not in a condition to stand heavy spring work and die off rapidly in the attempt to carry out their duties.

What appears to be fighting at the entrance of the hives is probably the effort of healthy bees to rid the hives of the infected members of the community. Concerning your other impression, it is unlikely that the bees would uncap the brood unless on the verge of starvation, and even then the sealed brood is rarely interfered with. It is unlikely that the young bees are being removed; it is more probable that, owing to the condition of the colony, some of the emerging bees are affected through malnutrition.

The dwindling should disappear when good conditions prevail; meanwhile, see that the bees are not kept so short of stores that they must economise. Stimulating conditions can often be brought about artificially by feeding sugar syrup, when warm, inside the hive—say five or six pounds in one quantity. The syrup is made by mixing sugar and water in equal portions by volume and constitutes a valuable change in food.

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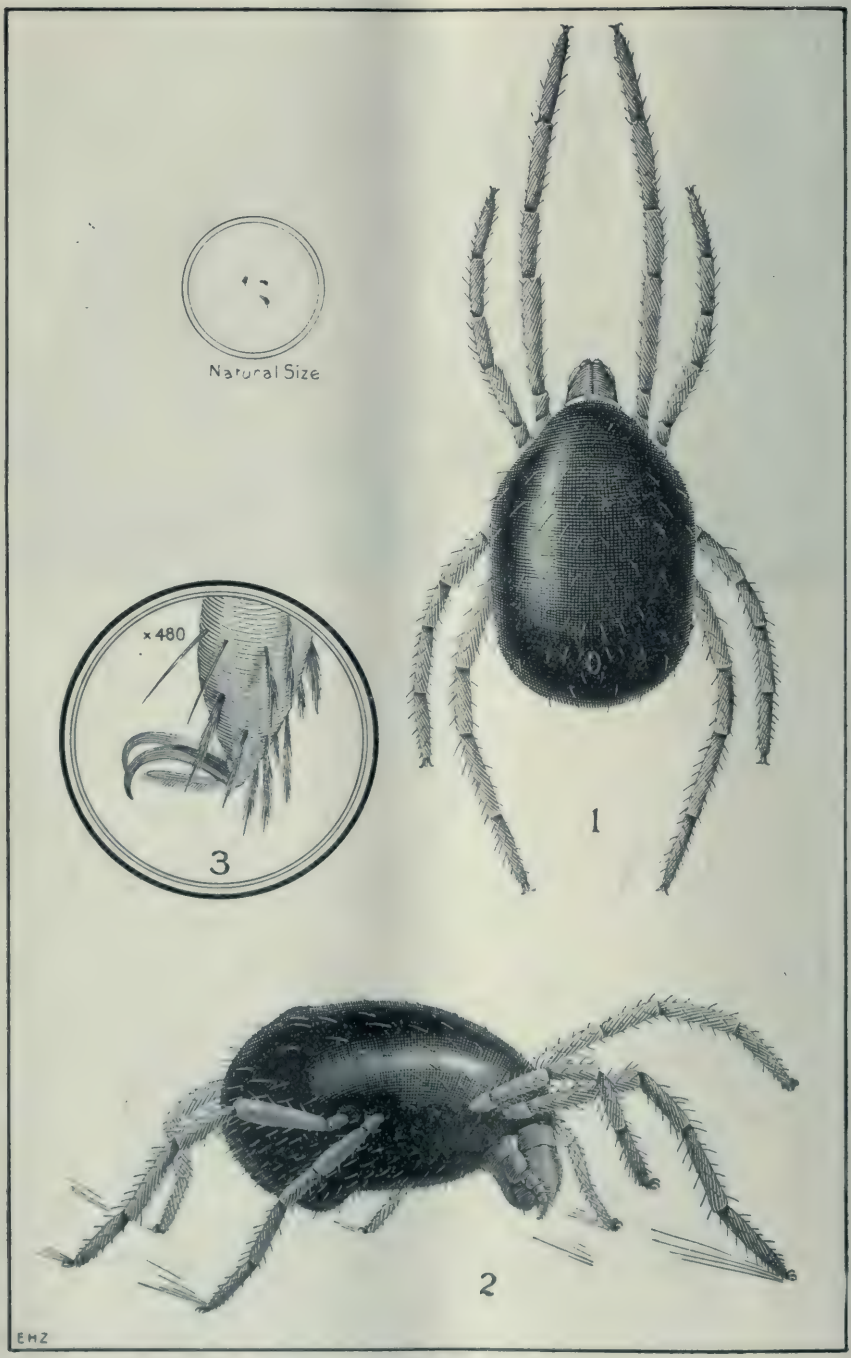
Mahona Cane at Duck Creek Experiment Farm.

Estimated yield, 45 tons per acre.

Loading Cane on to a punt on the Tweed River.



The Blue Oat Mite. (*Notophallus bicolor*).

1. Dorsal view of Mite. 2. Side view of Mite. 3. Foot of adult Mite.

The Blue Oat Mite

(*Notophallus bicolor*, n.sp.).

W. W. FROGGATT, F.L.S., Government Entomologist.

During the early part of last August the farmers in the Delungra district noticed that some pest or disease was attacking their young oat crops, and about the middle of that month Mr. John Fraser discovered that the flag of the oats on a 15-acre paddock was covered with small insects. Some of these Mr. Fraser collected and forwarded to the Department of Agriculture. On examining them I was surprised to find that they were a round-bodied mite belonging to the soft-bodied mites of the family *Eupodidae*.

On 20th August I visited the district and was able to investigate the extent of the damage and study the pest under natural conditions among the infested oats. The damage was confined to the paddocks of black and Algerian oats, and the mites had not spread over the adjoining fields of wheat or barley. Excepting the variegated thistle, which here and there in the infested oats was thickly covered with mites, and in a sickly yellow condition, none of the weeds were touched by the insect; but in the first paddock visited one could notice, even from a distance, all the flag of the oats turning yellow and brown at the tips, looking as if it had been badly nipped with frost. The mites, with dark blue bodies and bright red legs, were clustered on the upper surface of the flag of each stool of oats in countless thousands. They were very active, and the moment one touched the leaf they dropped off and hid. The crop was about 8 inches to a foot in height, very luxuriant and thick in consequence of the constant heavy showers; but the moist condition and rank growth seemed to suit these mites.

In the next crop examined, the owner, finding it changing colour through the mites' presence, had turned his stock in the paddock, and much of the crop had been eaten off, or trampled in the mud. Yet there were still multitudes of mites on the upright stalks, and quantities of dull red oval eggs were found at the base of the stools. Many stalks in this paddock were limp and decaying; but this may or may not have been caused by the mite infestation.

Under the circumstances—owing to the drought there was not a green thing growing in or about these paddocks last season—two queries inevitably arise: Where did this mite originate and what was its first food plant? Large quantities of chaff for feeding starving stock from all parts of the country were brought into the district during the drought, but it does not seem possible that these soft-bodied mites or their eggs could have been introduced into the district in this manner. The area of infestation, as far as I could learn, was about 5 miles round the township of Delungra.

Mr. C. French, junior, Government Entomologist, Victoria, informs me that a similar, if not identical species of mite appeared last August in Victoria, doing a considerable amount of damage to the potato, pea, lucerne, and other crops.

Description of Group.

This mite belongs to the soft-bodied group included in the Family *Eupodidae*. They have rather long legs, usually bright red in colour, and the darker body shows more or less well defined transverse lines or divisions bearing scattered hairs. Some of them have eyes; the mouth parts are simple, consisting of short thickened four-jointed palpi with rather small mandibles. The legs are six or seven-jointed, terminating in a pair of claws and usually with a plumed pulvellus. Banks says, "Some of the best-known mites belong to this family, usually found in damp localities mostly upon the ground. Some, however, are found on the leaves of trees. Many are carnivorous, feeding upon smaller creatures and the eggs of insects."

The members of the Genus *Notophallus*, to which our pest belongs, are all dark-bodied creatures, with red legs, with a red spot on the basal portion of the dorsal surface of the body. They are found in damp fields. Banks says: "Species of *Notophallus* have been found to be injurious to young plants, the mites sucking the leaves, and frequently causing the death of the tiny plants. One form is very injurious in the south-west." I can find no record of any species having been recorded from Australia, and therefore propose to call it the "Blue Oat Mite."

Description of Species.

Mouth parts and legs bright red; body deep dull blue, with an oval red patch on the apical portion of the dorsal surface of the body, another on the under surface, and a dull blotch of the same colour behind the head; both the legs and body covered with short scattered white hairs. When resting on the plant they appear to have a white spot on the anal opening on the back, but this is produced by a drop of liquid on the anal orifice on the centre of the red spot. On a level surface they can run very rapidly and are difficult to catch uninjured, as their bodies are so soft that the least touch crushes them.

Mouth parts projecting, rounded in front; palpi thickened, rounded, first joint large, second short, third about the same length but smaller and rounded to the tip. The body rounded and slightly oval, with three or four impressed transverse lines like segmental divisions. Legs long, the first and fourth pair longer than the second and third pair; the second joint is longest and the third shortest. Length of body, 1 mm. Length of body and extended legs, 2½ mm.

Banana passion fruit is more suitable for decorative or shade purposes than for utility as a commercial article. The fruit is not particularly attractive in appearance; it lacks flavour, is inclined to be sub-acid, and as a delicacy is not to be compared in any way with the common variety of passion fruit.—S. A. Hogg.

Neutralisation of Over-ripe Milk for Cheesemaking.*

J. G. McMILLAN, Dairy Instructor.

One of the greatest troubles that the cheesemaker has to contend with in this State, particularly at factories where supplies come from a number of sources, is that arising from milk which arrives in a condition too ripe for use in the production of first-class cheese. There is hardly any doubt that bad milk is responsible for a great deal of the bad cheese to be found on the Sydney market, and the generally accepted opinion is that during the last few years the quality of the cheese has gone backward.

Bad milk is mostly attributable to the supplier, but considerable contamination occurs through the conveyance of whey back to the farms in the cans in which the milk was brought to the factory.

As it will be impossible for factories to obtain ideal milk until legislation to deal with the dirty dairyman is introduced, the cheesemaker must for the present apply himself to making the best possible article from the raw product, for he receives both contaminated and over-acid milk, and in the summer months a considerable amount of the latter. Over-ripe milk is usually so termed when showing over ·24 or ·25 per cent. lactic acid (though in the warm weather the night's milk is often higher in acidity). In the manufacture of such milk into cheese, various processes for modification are in vogue, but the following are the two most generally used:—

Method No. 1.

1. Rennet at lower than the usual temperature, say 82 deg. Fah.
2. Add more rennet.
3. Cut curd finer.
4. Heat curd quicker and to a higher temperature.
5. Draw whey sooner than with a normal curd, and in certain cases complete cooking process in water.
6. Stir curd well after drawing whey and before cheddaring.
7. Pack shallower, if any, during cheddaring process. The depth of packing to be regulated by the firmness of curd.
8. Mill and salt earlier.

With a milk that is not very acid this method acts fairly satisfactorily, but when the working is likely to be extra fast the next method is preferable.

Method No. 2.

1. Set at a higher temperature than usual (say, 90 deg. Fah.) and add more rennet.
2. Cut finer
3. Heat to about 105 degrees Fah. in cooking process.
4. Draw whey off whilst cooking process is going on, and as quickly as possible after desired temperature has been reached.
5. Put curd on racks and stir well. Pile very little, but sufficient to bring about a good cheddar.
6. Mill curd when acid shows ¼ to 1 inch acid on hot iron.
7. Allow curd to mellow fairly well after milling.

*Condensed from Farmers' Bulletin, No. 136, in the press.

The second method is the one that I have practised and recommended for some years. The main difference, as compared with the first, is the setting temperature. Prior to renneting, accidentally, at a high temperature a high acid milk, and obtaining from it a first-class cheese, I practised the usual method, but in the final test in experiments at Moruya factory, I adopted the second method in a comparative trial with neutralisation. In dealing with over-ripe milk the object of the cheesemaker is to have the whey expelled from the curd before excess acid has developed. By setting at, say, 90 deg. Fah., and adding more rennet, coagulation is brought about more quickly, and a more rapid expulsion of whey therefore takes place. Another advantage is that the heat necessary to raise the milk to cooking temperature is less than that required to set at 82 deg. Fah., while there is also less danger of locking in moisture during the cooking process. When setting at a high temperature, it is necessary thoroughly to dilute the rennet and only to stir for a moment or two, as coagulation may occur in less than a minute. Experiments have given better yields with the second method than the first.

Although fairly good results can be obtained from over-ripe milk by the aforementioned methods, it was thought that owing to the success attained by the neutralisation of cream for buttermaking, similar treatment of milk for cheesemaking might prove beneficial. The Dairy Branch of the Department of Agriculture gave consideration to this matter as far back as November, 1917, and arrangements were made to commence a series of experiments to be conducted over the summer season of that year. Owing, however, to the officer who was to have carried them out leaving the State service, the experiments had to be postponed. Investigations were resumed at the commencement of the summer of 1918 by Mr. A. T. R. Brown, acting under instructions from the Dairy Expert. These first tests, although to a certain extent unsuccessful, were required in order to eliminate or modify those methods and neutralising agents which were unsuitable.

With a view of obtaining further information on the merits or demerits of neutralisation, in conjunction with Mr. O. C. Ballhausen I carried out a series of experiments at Bangalow, one point being firmly stressed—the necessity of first neutralising the milk. The neutralisers used were caustic soda, bicarbonate of soda, and washing soda.

The highest degree of acidity allowed to develop in the milk was ·26 per cent. That treated with caustic soda produced the best result, the matured cheese being good in texture, colour, and flavour. The colour was perfect. The curd in this case at the salting stage appeared to be too soft. It was found that though the acid was reduced in the milk to ·18 per cent., in the subsequent processes of manufacture the development of acid was quite as rapid as with the curd from a non-treated milk, owing to the alkali only reducing the acid and not the number of bacteria producing it. The process of coagulation was also prolonged, which further assisted bacterial development. The addition of a small amount of calcium chloride remedied the coagulation defects. Bicarbonate and carbonate of soda both produced a gassy

curd, owing to the evolution of carbonic acid gas (CO_2). It was consequently made apparent that the use of a carbonate in milk was impossible. Caustic soda was therefore considered to be the only practical chemical to use, as bringing about a rapid reduction of acid without production of gas.

Having discovered that milk could be properly neutralised by this means it was necessary to adopt methods that would check the rapid development of acid after neutralisation was accomplished, and bring the milk to such a condition that the whole process of cheese manufacture would be about six hours from renneting to salting. Our knowledge of pasteurisation guided us in this respect. Pasteurisation, however, reduces the coagulating properties. Laboratory tests proved that the addition of calcium chloride with milk heated to various temperatures, restored rennet action. At Bangalow, Mr. A. A. Ramsay (Principal Assistant Chemist of the Department of Agriculture) and I conducted a series of experiments extending over three weeks, when milk was raised to various degrees of acidity as high as ·7 deg. After neutralisation and subsequent pasteurisation to a temperature of 150 deg. Fah., and after being held at that temperature for twenty minutes, the milk appeared to have an excellent flavour—indeed, it was devoid of all taint. The curd in most instances appeared to be of good flavour, but very slow in developing acid. The cheese, however, was of very poor quality. The milk was not of the best, and the probability is that the pasteurising temperature was insufficient to destroy undesirable organisms; but as the desirable organisms would be destroyed, a free field would be left for the undesirable, which would account for the bad flavours in the cheese. The results of this experiment, after three weeks' hard work, were discouraging.

Experiments at Moruya.

In May, 1919, Mr. A. T. R. Brown and I conducted experiments at Moruya Cheese Factory, as a result of which the following conclusions were arrived at:—

1. That with milk showing acidity up to ·31 per cent. the use of lime in the whey only does not produce such good results as those obtained by skilful working under the fast-working method.
2. That in the case of milk not exactly over-acid but inclined to work fast, the addition of lime-water will assist in firming the curd; that the use of free lime is not to be commended, as it sets up decomposition of the proteid matter and produces ammonia.
3. That the neutralisation of high acid milk to a normal degree of acidity by means of caustic soda, using lime-water in the whey, will produce a good marketable cheese; and that the soda must be well diluted with water and stirred rapidly through the milk.

Experiments at Seven Oaks.

As the Moruya experiments had been carried out in cool weather, it was necessary to make further experiments during the warm period of the year, when milk is likely to arrive at a factory in an advanced state of ripeness. Seven Oaks Factory, Macleay River, was selected as a suitable place for the

investigations, and here, assisted by Mr. A. McPhillips, of the Dairy Branch, I conducted further experiments. Some deviation was made from previous procedure during the latter period of the investigations. All the milk delivered to a cheese factory is not over-ripe, only a small percentage generally being so. It was therefore assumed that 50 per cent. of the milk was in an over-ripe condition, and in the latter period of the experiments, night's milk which had developed high acid was neutralised with soda and then pasteurised and subsequently mixed with about an equal volume of raw morning's milk. By this means it was thought the effect of pasteurising the night's milk would not interfere with the coagulative properties of the mixed milks, which conjecture proved fairly accurate.

This series of experiments showed:—

1. That if over-ripe milk is first neutralised with caustic soda, pasteurised and mixed with sweet milk, it will produce good cheese. Pasteursing must be done by the holding system; if done by the flash system, when a large quantity of neutralised milk is being treated, acid will be developing all the time, and the latter part will probably coagulate when heated. The batch system allows of a quicker checking of bacterial action.
2. That with milk moderately over-acid, the working of the curd under the fast method (No. 2) will produce results as good, if not better, than those produced by neutralisation if the sour portion is not pasteurised.

The cheese obtained from the various lots of milk was judged on two occasions for flavour, texture, and condition. The points allotted the first time are not shown in this summary, but those allotted as the final judgment on 28th June are given in full with remarks.

Significance of the Experiments.

The probability is that further experiments will show that sour milk can be neutralised, pasteurised, and made into first-class cheese without the addition of untreated milk if artificial acids are added prior to renneting, so as to assist in the expulsion of the whey from the curd. Further experiments should be made to prove this. I am quite satisfied that sour milk can be successfully treated, provided the whey is not separated from the curd. It must be borne in mind, however, that the experiments herein described were designed to discover a treatment which must be regarded primarily as of an emergency nature, and as dealing with a condition which should not be considered in any degree properly normal. The endeavour to determine the best method whereby sour milk may be utilised must not, in short, be regarded as support of the milk supplier in the practice of sending sour milk to the factory.

The treatment of sour milk incurs a certain amount of expense and extra labour. The policy of grading and paying for milk in the same way as is done for cream at butter factories would recompense the cheesemaker for his extra trouble and assist in reducing the percentage of sour milk.

Concerning the use of caustic soda in milk, it may be remarked that this appears to many persons like the adding of a poison; yet the chemical change is exactly the same as by adding either carbonate or bicarbonate of soda, excepting that the two latter produce CO_2 (carbonic acid gas). In all three cases the resulting salt, by the combination of the sodium base with the lactic acid, is sodium lactate. The amount of caustic soda required is comparatively small, ·7 oz. reducing the lactic acid by one point in 1,000 lb. of milk. For example, 100 gallons of milk arrives at a factory showing ·35 per cent. acid, and it is desired to reduce the acidity to ·22 per cent. before pasteurising. This requires approximately 9 oz. of soda, costing about 4½d.

Conclusion.

The final grading proves that the system of manufacture adopted during the latter period of the experiments can be confidently recommended, and although the system of dealing with over-ripe milk is not yet perfect, the investigations so far as they have gone may be considered thoroughly practicable. It is further evident that over-ripe milk partially neutralised with caustic soda (NaOH) and lime-water used in the whey will assist in improving cheese, but the process cannot be said to be as thoroughly reliable as neutralising with caustic soda and subsequently pasteurising.

Since these experiments were completed, milk of varying degrees of acidity, some containing as much as ·6 per cent. lactic acid, has been neutralised, then pasteurised, and manufactured into good quality cheese without the addition of untreated milk.

Points allotted in Final Judging on 28th June, 1920, to Cheese manufactured from different lots of Sour Milk.

ot.	Flavour.	Texture.	Condition.	Total.	Method under which Milk was treated.	Remarks.
A...	37	28	19	84	Calcined magnesia and lime in milk.	The previous unclean flavour turned into a fruity flavour; there was openness in texture, but broke fairly well; colour was irregular.
B...	39	28	19	88	Untreated.....	Previous unclean flavour more pronounced; texture short and rather crumbly; colour fairly clear.
C...	38	27	18	83	Calcined magnesia and lime.	Bad flavour; open and crumbly; bleached colour.
D ..	41½	29	19½	90	Untreated	After-flavour unclean slightly but not objectionable; texture a little short but close; colour slightly irregular.
E...	37	29	19	85	Magnesia, caustic soda, and lime.	Flavour very insipid, deteriorated considerably from previous examination; difficult to define, evidently flavour is or may be due to the presence of undissolved magnesia in the curd; texture close but does not break too well; colour dull.

POINTS allotted in Final Judging—*continued.*

Lot.	Flavour.	Texture.	Condition.	Total.	Method under which Milk was treated.	Remarks.
2 A...	40	29	19	88	Untreated milk. Acid in whey reduced to ·15 with NaOH.	Unclean flavour developed since previous examination; texture close and body firm; colour slightly irregular. As this cheese was made from milk containing ·31 per cent. acid, a deterioration in flavour might be expected when four months old.
2 B...	40½	28½	18½	87½	Caustic soda and lime.	Unclean flavour more pronounced than previously; texture open and rather inclined to shortness; colour irregular.
3 A...	41	29	19	89	Untreated	Flavour in this had considerably improved; there was still a shortness in texture, but body had improved; colour dull.
3 B...	39	28½	19	86½	Caustic soda and lime.	Unclean flavour still more pronounced than previously; texture loose and body mealy; slightly bleached in colour.
4 A...	39	28½	18	85½	Untreated	Flavour slightly improved, but insipid. The previous pronounced bad flavour had given place to a more insipid one; texture short; colour mottled.
4 B...	39	28½	18½	86	Caustic soda.. ...	Flavour improved, previous sourness disappeared to a great extent; texture short, but improved in body; colour dull.
5 A...	41½	29½	19½	90½	Untreated	Flavour fairly clean; texture and body good; colour good.
5 B...	39	28	18½	85½	Caustic soda.. ...	Previous sour flavour developed more into uncleanness; texture short; colour dull.
6 ...	39	28	19	86	Magnesia in milk and lime-water in whey.	Unclean flavour; short texture, body dry; colour dull.
7 A...	40	29	18½	87½	Caustic soda in milk, lime-water in whey.	Flavour slightly improved. In this instance the shortness in texture had disappeared and improved in body; colour was also slightly better.
7 B...	41	29½	19½	90	Caustic soda in milk, lime-water in whey.	Flavour considerably improved, showing only a slight uncleanness; texture was also close and body firm; colour, which was previously bleached, was now clear.
7 C ...	38	28	18½	84½	Caustic soda in milk, lime-water in whey.	Unclean flavour; body dry; colour bleached.
7 D...	36	29½	19½	85	Caustic soda in milk and whey.	Flavour in this case was very fruity; texture was slightly open, but body firm; colour clear.
8 ...	39	29	19	87	Caustic soda in milk, lime-water in whey, milk pasteurised.	Unclean flavour; texture close, body greatly improved with keeping; colour rather dull.
9 ...	40	29	19	88	Caustic soda in milk pasteurised, lime water in whey.	Unclean flavour; short texture; colour dull.
10 A	44	29½	20	93½	Caustic soda in milk, and pasteurised.	Clean flavour; very slightly open, breaks well, with splendid body; colour excellent.

Points allotted in Final Judging—*continued.*

Lot.	Flavour.	Texture.	Condition.	Total.	Method under which Milk was treated.	Remarks.
10 B	38	28½	18½	85	Caustic soda in milk, and pasteurised.	Flavour sweet, unclean; texture short; colour dull.
10 C	41½	29½	19½	90½	Caustic soda in milk and pasteurised.	Flavour fairly clean; slightly open texture, but good body; colour slightly dull.
10 D	42½	29	19	90½	Caustic soda in milk and pasteurised.	Flavour clean; slightly open in texture; colour irregular.
10 E	44½	29½	20	94	Caustic soda in milk and pasteurised.	Bright, clean flavour; texture and body almost perfect; colour perfect.

The above final grading-marks show but slight alteration in the total points awarded in most instances. Comparing the points with those allotted at the first judging, among the lots specially to be noted are 1 E and 2 A, treated with magnesia and untreated in milk respectively, both of which declined in flavour. No. 3 A, also untreated, improved to the extent of 2 points, whereas No. 2 A went back 2 points. In the case of the latter lot, caustic soda was added to the whey to reduce acid; a similar test was made in Lot 7 D, which also deteriorated from 91 to 85 points. The flavour, particularly in No. 7 D, was the main point affected; whether this defect is due to the extra addition of caustic soda or to a biological change cannot be determined. No. 4 A, an untreated lot, improved in flavour. Lots 7 A and 7 B jumped from 84½ and 84 points at the first judging to 87½ and 90 points respectively. The treatment in both cases was caustic soda in milk and lime water in whey; the alteration in texture and body was very noticeable. Nos. 6 and 7 D went back from 87½ and 91 points to 86 and 85 points respectively. Lots 8 to 10 E all showed improvement in maximum points, except 10 B, in which calcium chloride ($CaCl_2$) was used.

Starvation in the Hive.

The following is extracted from the letter of a Tablelands farmer, who reported serious losses among his bees:—"Sunday week I noticed one colony was weak with quite a few handfuls of dead bees in the bottom of the hive, and last Sunday I was surprised to find that two colonies were completely dead in the bottom and some dead in the cells. All the brood were more or less half sealed. There were signs of the queen laying to the last day, as some cells showed very little dried-up matter."

Mr. W. A. Goodacre, Senior Apiary Inspector, replied thus:—"I consider the losses mentioned were caused by starvation. The dead bees piled up on the bottom board inside the hive, others dead in the cells, and no honey in the hive, are all clear indications of starvation. The bees may have had some honey stored earlier, but in the endeavour to raise brood all the stores were consumed. The inactivity of the bees mentioned would be proof of the absolute dearth of nectar from the field; bees will not work to any extent when there is nothing for them to gather. From perusal of the letter I do not consider that disease was present.

"When bees become inactive and sluggish in the spring, especially if the colonies are fairly populous, careful note of the stores of honey is necessary, and in no case should the colony be left short. The spring being a natural period for brood-raising, a good quantity of stores is required. If there is a dearth of nectar from the fields, and bees are short of stores, they will often quickly use the remaining quantity and then abscond or starve. Sugar and water, equal quantities by volume, stirred and fed warm inside the hive, is excellent food, or in some cases, if other colonies have ample supply, the stores can be equalised."

The Tick Bean

(*Vicia faba*).

A Green Manure Crop for Irrigation Areas.

A. N. SHEPHERD, Assistant Inspector of Agriculture.

It may be said that taken as a whole the soils of the Murrumbidgee Irrigation Areas are very deficient in humus content. To remedy this one has either to add vegetable matter in the form of farm-yard manure—which on large areas is not practicable, except perhaps in isolated cases—or by the ploughing under of crops grown specially for the purpose. The latter is being done at the present time on limited areas, various crops being used for the purpose.

The chief requirements of such a crop are, firstly, that it shall be sufficiently grown to be ploughed under in the early part of the winter, so as to allow of complete rotting before the irrigating and cultivating season—in other words, early enough to prevent the vegetable matter thus added being burnt out of the soil by the excessive heat of summer. Secondly, such a crop must produce an abundance of growth, enabling a large bulk of vegetable matter to be returned to the soil. Thirdly, a leguminous crop must be used, if possible, in order that nitrogen taken from the air may be added to the soil.

During last season the growing of Tick beans has been very successfully carried out on Mr. J. Hetherington's farm at Leeton. They were sown on 10th March in a red, sandy loam, through an ordinary wheat drill, in rows 7 inches apart, at the rate of 1 bushel per acre. Superphosphate was used at the rate of 1 cwt. per acre. Owing to the very dry season the beans were regularly irrigated every fortnight until the end of May, from which time good rains were recorded. Very heavy growth resulted, the crop attaining a height of from 5 feet to 6 feet, as can be seen from the accompanying illustrations. It was also noted that the beans stooled very well.

These beans should be especially useful as a green manuring crop on the Irrigation Areas, as they respond so readily and abundantly to the water applied. It was very noticeable that where the plants did not receive an abundance of water, the growth was rather stunted.

The beans, although only shallow rooting—which may have been due to the irrigating water not making it necessary for the roots to go deep looking for moisture—produce an abundance of fine roots; in fact, at ploughing time the top 3 inches of soil was like a moss bed, so prolific were the smaller roots. A great many bacterial nodules were also noticed on the roots.

Another great advantage in the use of Tick beans as a green manuring crop is the ease with which the growth may be ploughed in. The plants

Ploughing in Tick Beans.

Notwithstanding the prolific growth, it ploughs in comparatively easily.

A Crop of Tick Beans at Leeton.

The illustration affords some idea of the weight of the crop.

being tall and straight, they can be completely covered by attaching a chain to the plough; no choking of the plough is experienced, such as is the case with field peas.

This crop was ready for ploughing under at the beginning of July, at which time the plants were flowering. To estimate the yield, a plot was taken, the plants carefully dried, and the soil very carefully removed from the roots by washing; although a few of the smaller roots may have been lost, a fairly accurate idea of the weight of the crop was obtained. This was found to be at the rate of 15 tons 12 cwt. 3 qrs. per acre.

An analysis of the complete plant by the Chemist's Branch gave the following results:—

Nitrogen	·42
Equivalent to ammonia ...	·51
Lime, as oxide	·085
Phosphoric acid	·111
As tricalcic phosphate	·242
Potash, as oxide	·54
As sulphate of potash	1·0

One ton of beans would thus supply:—

Nitrogen (as ammonia, 11·4 lb.) ...	9·3 lb.
Lime	1·9 ,,
Phosphoric acid	2·48 ,,
Potash	12·09 ,,

In this particular case the crop would give:—

Nitrogen	145·429 lb.
Lime	29·711 ,,
Phosphoric acid	38·781 ,,
Potash	190·057 ,,

It will be seen that the Tick bean compares quite favourably with other legumes, produces a very heavy crop of vegetable matter, and under irrigation, if sown early, will mature so as to allow of it being ploughed under in early or at latest mid-winter.

Stock do not take readily to Tick beans as a fodder; in fact, if there is any other feed at all available they absolutely refuse to eat it. At the same time it should be very useful as a bee plant, for it produces large quantities of flowers, and it was noted that the bees were very busy among the plants at flowering time.

The Powder Post Beetle.

The powder post beetle (*Lyctus brunneus*) is one of the most serious timber pests about Sydney at the present time. It lays its eggs in the wood before it is cut up, and the larva, hatching out afterwards and feeding in the wood, then pupates and the small brown beetle emerges. The best method of dealing with the pest is to treat the infested wood with creosote or kerosene. These oils kill the larvæ on coming in contact with them. The more oil that can be got into the wood the more successful the treatment.—W. W. Froggatt, Government Entomologist.

Chats about the Prickly Pear.

No. 8.

J. H. MAIDEN, I.S.O., F.R.S., F.L.S.,
Government Botanist, and Director, Botanic Gardens, Sydney.

Apparatus.

Rollers.—A good deal of useful work has been done in the crushing of pear by heavy rollers, and sometimes the bruised pear is sprayed in addition. Mr. James H. Doyle, of Invermein, Scone, had much experience with pear, and he used (when I was at Scone) what he called a roller and a crusher. The roller is much the heavier and consisted of a long ironbark log. (See illustration, p. 46.) The crusher is also a roller, but of iron, and is lighter. The crusher was used direct when the pear was not over 2 feet high. When the pear was higher the roller was used. Bullock teams were used for this work.

Sprayers.—One sprayer utilises the motive power of acetylene gas, which is generated as the spraying proceeds, but there are quite a number of sprayers on the market, as every orchardist and gardener knows.

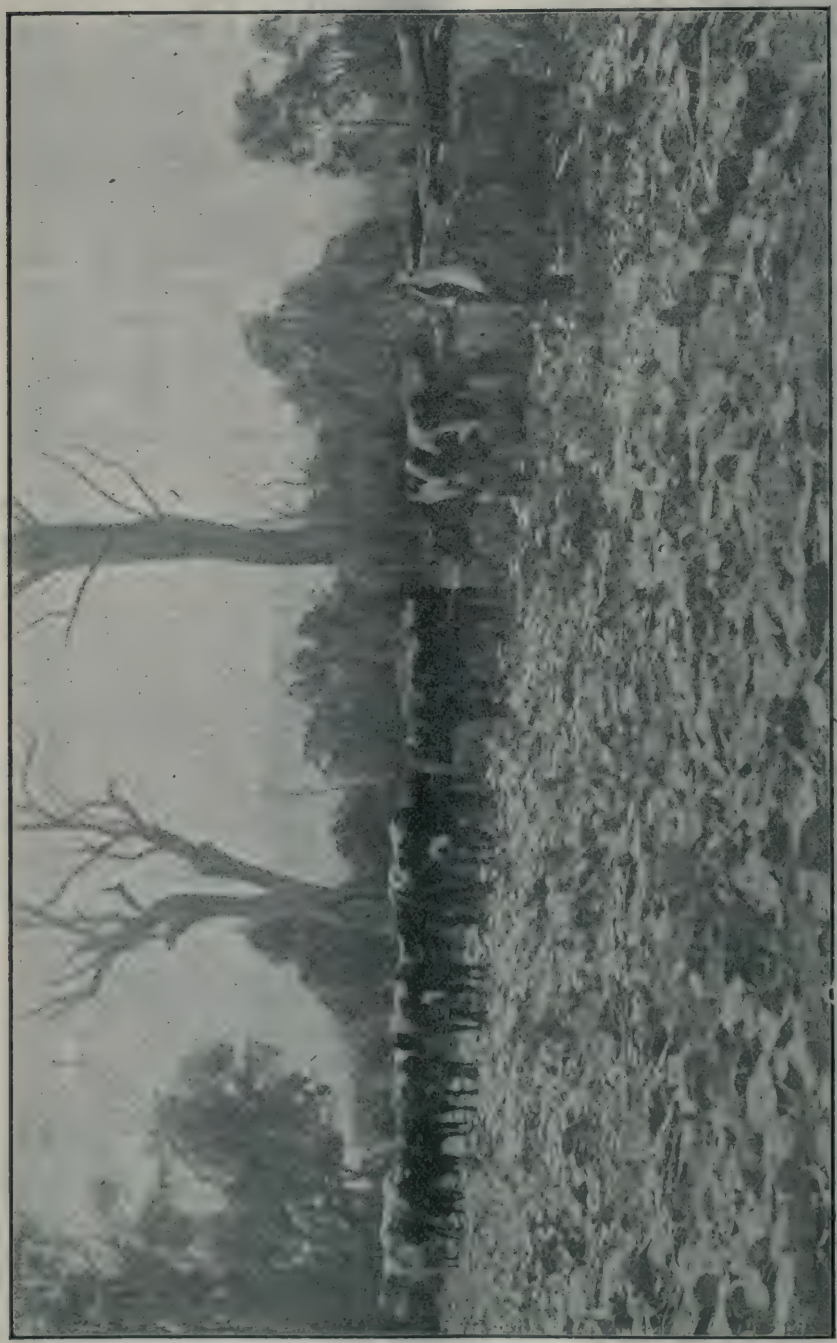
Injectors.—Then we have various injectors—for example, the well-known English appliance (often like a walking-stick, to avoid the user stooping), in which a hollow point pierces a dandelion or other weed in a lawn, and pressure on a spring releases a little of the poison, which destroys the weed. One inventor uses a deliquescent pill in his injector, which is pressed into the pear. There are various injectors of more or less merit, chiefly in use in Queensland.

My Scone Experiments of 1907–8.

The most important practical result of these experiments was that they proved that pear cannot be killed by spraying alone. It is comparatively easy to kill the fleshy "leaves" (technically called "joints") of the prickly pear, so that the plant may appear quite dead. For example, the pear on a 5-acre block was "killed" in that way. The above-ground vegetation appeared dead, and other work was proceeded with, but in the course of a few weeks the pear on this portion was almost as vigorous again as usual. Different blocks were treated with various strengths of arsenic, dissolved in a solution of caustic soda or carbonate of soda (washing soda).

Now, in a prickly pear there is what is known in common language as a "bulb." It is immediately underground, and it is nature's arrangement to enable the plant to tide over an excessively dry or difficult time—for example, injury to the joints or roots. The bulb is much like a joint in shape; the roots extend from it, and so do the joints. It is a store-house of what botanists call reserve material; it contains starchy bodies and water necessary for the continuance of the life of the plant.

The ordinary methods of spraying affect only the portion sprayed upon—that is, the above-ground portion; when trouble comes, the bulb just "lies



A Long Ironbark Log used as a Roller at Scone.

low," and in due course replaces the plant; given favourable conditions, the pear may be as bad as ever.

A number of experiments were made at Scone by wounding the bulb alone, and though this action was found to injure the vitality of the plant, it was not fatal. The implement employed was a weapon about 5 feet long, consisting of a strong wooden handle (like a rake-handle) capped with a steel point. In other words, the handle was shod with steel, and the cap was continued into a chisel-like weapon.

The method finally decided upon was to treat an area with the above weapon, and then spray the whole of the plant, taking particular care that some of the liquid ran into the wounded joint. It appeared that this should be done soon after the wounding—that is, the sprayer should soon follow the man engaged in stabbing, since nature begins at once to repair the wounds inflicted by the stabber, and to close the tissues to the free access of the poison.

When poison was applied to the wounded bulb I never knew a case of the plant failing to die. It was also found that the whole plant should be sprayed, and not the joints or leaves only. It was observed that when the bulb is injured the plant falls over and the joints lie prostrate on the ground, or at all events in most cases touch the ground in more places than before. This just suits the pear, which roots at every joint, and so multiplies the evil. But when the whole plant, wounded bulb and all, is sprayed, the whole of the plant dies. We traced the dead roots for a considerable distance, while the green portion of the plant was as dead as the proverbial cock-robin.

Having established the principle that the bulb, as well as the plant above ground, must be destroyed, the way is clear for inventors. Ingenious individuals are wanted to invent implements and devices to do this stabbing of the bulb economically. A twist of the wrist to open up the bulb is found necessary in practice. Devices for economically applying the poison to the wounded bulb are also required. I have already seen two such devices for poisoning and stabbing in one operation—an Australian one and an English one.

I am of opinion that the slashing or wounding of the joints recommended by so many experimenters with sprays is unnecessary, and therefore a waste of money.

Of course, bad pear country is impregnated with pear seed, and there is always a danger of pear re-occupying a paddock from this cause alone. If the plants are treated with a hoe as they appear, they may be destroyed without much labour.

The experiments showed that the best strength was 1 lb. commercial white arsenic and 1 lb. caustic soda, dissolved in 20 gallons of water. Caustic soda is a most acrid substance, of course, and produces severe sores on the hands, &c., of any person touching it. It is a more efficacious solvent than washing soda, but I fear that its dangerous nature will prevent most people from having anything to do with it.

On the whole, I think that an arsenical preparation is most efficacious. If, as the result of the further experiments, my view is borne out, then the official declaration of the fact will cause manufacturing chemists to fill requirements.

I do not attach so much practical importance to the bulb as I once did. I still think that the stabber should be occasionally used, with special plants, in order to make a good job.

More Recent Experiments.

Since 1910 the Department of Agriculture has supervised trials with numerous preparations, proprietary specifics, and mechanical methods of destruction suggested by officers of the Department and by others. A large amount of work has been done along this line, but with little or no success as to the great majority of the specifics and methods.

The difficulties of treating prickly pear in any manner that has a commercial recommendation have also directed attention to such other agencies as fungi, bacteria, and insects, and various trials have been conducted by the Department along these lines, without anything definite yet being reached.

A Competition Suggested.

As to the future, I would make the following unofficial suggestions for a competition in clearing infested land:—

1. Arrangements might be made for the practical test of (*a*) spraying machines and other appliances and devices for the economical distribution of liquid and solid poisons with the view to the destruction of prickly pear; (*b*) other machines, appliances, and devices for destroying pear.
2. Owners of specifics for the destruction of prickly pear might be invited to conduct experiments.

The above experiments should be free of cost to the Government, except in regard to supervision of the experiments and the application of such tests as may be necessary with the view to securing impartial comparative trials.

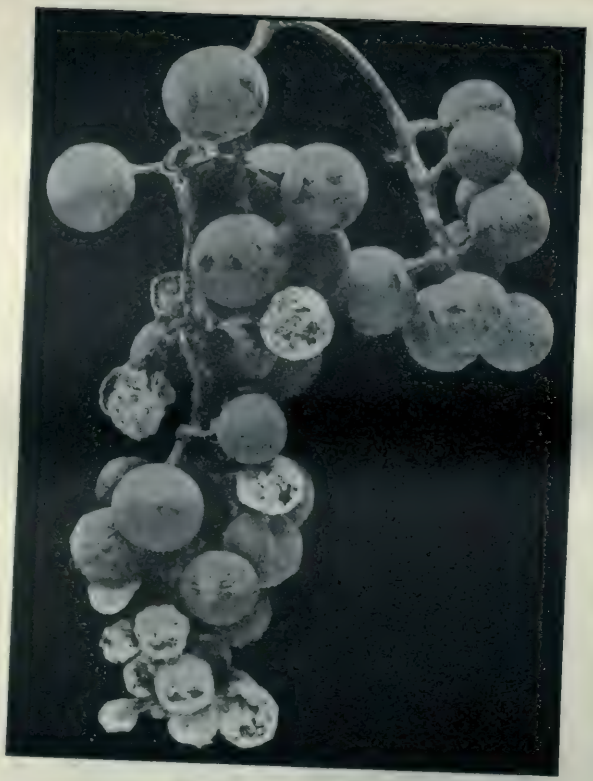
If there is a mechanical device or specific of special value, these experiments would probably disclose it, and the publication of a decision to that effect would immediately render the property of great value.

The way in which effect should be given to these suggestions would require consideration, but the problem would not be a very difficult one.

My personal experience so far leads me to the belief that some solid preparation of arsenic and soda (one containing more or less sodium arsenite) is most deadly to prickly pear. Experiments in open competition may show that some other substance (including arsenious trichloride) is more efficacious.

Cost is the keynote of all work in fighting prickly pear. Thousands of individuals know how to kill prickly pear, but the agency may be too expensive or objectionable in some other direction.

Early stages of Downy Mildew on under-surface of leaf of Zante Currant.



Downy Mildew on Grapes.

[*After Duggar.*

Under-surface of leaf of Zante Currant, badly infected with Downy Mildew.

Second crop of Spores.

Downy Mildew of the Vine.

C. O. HAMBLIN, B.Sc., B.Sc.Agr., Assistant Biologist.

Downy mildew was observed in this State at Albury in January, 1918, and in the same month its occurrence was noticed at Glenfield—much nearer to Sydney.

During the summer of last year it did a fair amount of damage around the County of Cumberland. The disease sometimes appears very early in the season, but unless it has conditions favorable to its development it makes little headway. Moisture and warmth are both essential, particularly the former. It was noted at Richmond as early as 6th October this year, but made no headway owing to the dry weather. Specimens were collected from the Murrumbidgee Irrigation Area early in November, and latest reports indicate that the damage has been very serious.

The fungus (*Plasmopara viticola*) belongs to the group of organisms which includes Irish blight of potatoes and tobacco mould.

The wintering spores, which have been hidden in dead tissue of leaves and leaf stalks lying about the vineyard, appear to carry the disease over the winter. Portions of the fungus are probably held also in the newer canes and have even been recorded in older parts of the vine.

When a leaf is infected in the growing season it gives rise on its underside to large numbers of tiny branching structures which bear the conidia or summer spores. To secure satisfactory germination and reinfection of another leaf, these spores must be able to discharge their tiny swimming zoospores into water. Thus it comes about that the fungus is most likely to spread rapidly in showery weather.

Warm moist days, such as have been frequent this season, create ideal conditions for the rapid dissemination of the spores. Once they have come to rest on the surface of a leaf, the tiny swimming spores give rise to a germ tube and, having established themselves by sending down their roots, or hyphæ, freely interpenetrate the tissues of the leaf. Once infected the leaf is able to produce continuous crops of spores. The first sign that a leaf is affected is a yellow spot on the upper surface, sometimes described as an oily spot. Soon the underside shows the greyish white patches which are really masses of spore-bearing stalks. The fungus is then ready to begin again on a new leaf centre.

This rapid production of spores in vast numbers means that, given the conditions favorable to germination, the disease will be widespread. Later on, the leaves turn brown and the tissue dies in brown patches. The fungus attacks leaves, young twigs, and fruit. In cases where the fruit is attacked early, it shrivels and does not develop but produces a crop of greyish white spore-bearing tissue as on the diseased leaves. When attacked in the late stage the fruit rots and discolours, becoming worthless. When badly damaged the leaves drop. Badly affected vines may be seriously defoliated.

Control.—Spraying has proved the most effective control, and the nature of the disease indicates it as the best method. The almost universal opinion of those who have studied the disease is that it can be readily controlled if Bordeaux mixture is used as a spray and applied in good time to anticipate an outbreak. The very first appearance of the fungus in a district, and the prevalence of showery weather should be a sign for all vignerons to commence spraying. Bordeaux mixture at summer strength (6.4.40) has proved very effective indeed. Where good lime is not obtainable Burgundy mixture should be substituted, and should be made as recommended in the Department's Bulletin on "Spraying" and used at summer strength. For small growers who are not inclined to go to the trouble of making their own Bordeaux mixture, it may be stated that some of the commercial brands of Bordeaux paste and Bordeaux powder gave effective control in experiments last season.

It is necessary to continue spraying at intervals of from ten to fourteen days, practically up to the time of ripening, to prevent the fungus from making headway. To avoid staining or injury to ripening fruit by the spray fluid, some growers in districts where the disease is prevalent use ammoniacal copper carbonate as a final spray, but this may only occasionally be necessary.

Spotted Wilt of Tomatoes.

With a view to determining the cause of this disease, the Biological Branch of the Department of Agriculture has made a careful microscopic examination of diseased plants. So far the examination has revealed no organism likely to prove causal. There are no traces of fungi.

Bacteria are, of course, almost omnipresent, but there are no indications in this disease of the presence of large numbers of bacteria, such as usually occurs in bacterial diseases of plants. Last year various bacteria were isolated, and healthy tomato plants infected, but all the results were negative, failing to produce the disease. At present, though the field indications are that the disease is infectious, the Department is unable to indicate the means of transmission, and all attempts to transmit the disease from diseased to healthy plants have so far failed.

Diseased leaves brought into contact with healthy plants have not brought about infection. The expressed juice of diseased plants when introduced into healthy plants did not give positive results.

The possibility of insect transmission has been considered. Two insects suspected (*Nezara viridula*, and the common green aphis) have been taken from diseased plants and put on healthy ones, but no transmission of the disease has been thus effected. The only lesion revealed in microscopic examination of the leaves is collapse of the epidermal or superficial layer of cells in patches. A careful examination of field data seems to discount the possibility of the disease being normally seed-transmitted.

Of various specifics recommended, none have apparently yielded satisfactory results

So far as further research goes, the Biologist is practically at a standstill for the want of suitable control houses, and a small experiment area in which to continue the work.—Chas. O. Hamblin, Assistant Biologist.

Diseases of Bees in New South Wales.

[Continued from Vol. XXXI, page 888.]

W. A. GOODACRE, Senior Apiary Inspector.

European Foul Brood (*Bacillus pluton*).

European foul brood has given a good deal of trouble to American bee-farmers, and in some cases is more feared than American foul brood; South African apiarists, too, have had rather a bad time with the disease, which in places has become fairly prevalent before being recognised. At present European foul brood is not prevalent in New South Wales—during the last three seasons I have not found an affected colony. The disease is a serious one, and, as in the case of American foul brood, it must be the apiarist's business to become thoroughly acquainted with its symptoms and with precautionary measures.

At first sight of a colony severely infected by European foul brood, the diseased matter would suggest itself as American foul brood, but a comparison of the symptoms of the last-mentioned disease (as described last month) with those now to be discussed will help the apiarist to distinguish a difference. In *Farmers' Bulletin* No. 975, U.S. Department of Agriculture, Dr. Phillips states that European foul brood is a disease of weak colonies; while at times one may observe larvæ dead of the disease in strong colonies, usually they are removed before the disease can do much harm. It should be pointed out, further, that it is the colony which is failing to increase in strength in the spring which is most seriously affected, for a young colony which is increasing in strength is often able to overcome the disease. It is, therefore, a disease of weak colonies rather than of small colonies.

The bee-farmer will see from the foregoing that bees under good conditions can overcome European foul brood—an important point of difference between this and American foul brood, which is never cured without treatment.

Symptoms.—As will be seen by the illustration of European foul brood published last month, the majority of infected larvæ die before being sealed. Worker, queen, or drone larvæ may become infected. Other symptoms may be enumerated as follows:—

1. The infected larvæ assume unnatural positions in the cells. (See illustration published last month.)
2. The colour of infected larvæ changes from pearly white to a slightly yellow colour, deepening until the dead larvæ become a brownish-yellow, greasy mass in various positions in the cells. (*Bulletin* 276, Ontario Department Agriculture. Illustration No. 3.)

3. Other infected larvæ in the same comb retain their curved shape, the segments and tracheæ (air tubes) being plainly visible, and the colour becoming greyish-yellow, and finally dark brown.
4. Dead larvæ are found after being sealed, but the proportion is very small when compared to the unsealed dead larvæ.
5. The diseased remains are slightly "ropy," but the ropiness is not so pronounced as in American foul brood.
6. The cappings on such cells as are sealed may be discoloured, sunken, and perforated.
7. The odour from infected brood is not of the offensive glue-pot type that characterises American foul brood in an advanced stage, but a sour smell is often evident. Odour is only one of the symptoms, however, on which the apiarist must base his diagnosis.

The disease is highly infectious, but usually disappears during a honey flow. The manner as to how infection is spread has not been clearly proved.

Precautionary and Control Measures.—As with other bee diseases, modern methods of management, use of good material, and a habit of observation may be described as preventives. Use of these and of a good vigorous strain of Italian bees is the surest way to prevent an outbreak of European foul brood. Italianising is of importance. Italian bees are, in most cases, vigorous enough to combat the disease.

Every endeavour should be made to winter colonies in good condition, so that the bees will come into spring in a vigorous state, for spring is the dangerous season so far as this disease is concerned.

Pending a definite diagnosis of any condition suspected of being European foul brood, the apiarist should observe the precautions to prevent the spread of infection recommended in the case of American foul brood.

Treatment.—Re-queen with young queens from resistant Italian stock, and endeavour to get the colonies into a populous and progressive condition. Infected weak colonies should be united so that strong colonies will result. In some cases, if nectar is being gathered and the colonies are not cleaned up, the shaking treatment (see previous article), combined with re-queening, will probably have a beneficial result. In the case of European foul brood, however, the transferred colony may be immediately assisted with a frame or two of healthy Italian brood. Neither is it necessary to destroy or disinfect any material or honey where European foul brood only is concerned.

Sac Brood.

Although the infecting agent (or germ) is so small that it cannot be detected by microscopical examination, sac brood has lately been proved to be an infectious disease. It is not a serious menace to the bee-keeping industry, for the bees are usually able to clear the diseased larvæ from the cells and free the colony from infection before much harm is done. Bee-farmers should become acquainted with the symptoms, so that the disease can be distinguished from foul brood.

Following are the points of difference between sac brood and foul brood:—

1. Dead larvæ which are stretched out in the cell in sac brood are not found in unnatural positions as in European foul brood.
2. Larvæ dead from the effects of sac brood can, if a twig or dry grass stalk is inserted carefully into the cell, be removed intact. The extracted matter resembles a tiny sack, with contents of a watery nature. In American foul brood the matter is ropy, and in European foul brood the larvæ cannot be lifted out intact, for the larval skin is too rotten.
3. In sac brood the worker bees remove the dead larvæ; there are no dried scales as in foul brood.
4. There is very little, if any, odour where sac brood is present.
5. In larvæ infected with sac brood the colour usually varies from light-yellow to brown. (The coffee-brown colour of American foul brood is not present.)
6. Both sealed and unsealed larvæ are affected in sac brood.

It is rarely found that any treatment is necessary, but if it should be noticed that the infection is sufficient to weaken a colony, then a young Italian queen from vigorous stock should be introduced. No other treatment is recommended.

Brood Dead from other Causes.

Not only disease, but certain abnormal conditions, may cause the death of brood. Brood may be affected by being (1) chilled, (2) starved, and (3) overheated.

Chilled Brood.

If bees desert a hive where brood is present, such brood will certainly chill; and in other cases where intense brood-raising goes on in the spring, a cold snap—by compelling the bees to make a more compact cluster, and thereby to leave a portion of the brood exposed—may cause some of the brood to chill. Apiarists sometimes fail to make a sufficiently careful diagnosis of a suspicious condition—sometimes with the disastrous effect that American foul brood is classed merely as chilled brood. Yet the features that distinguish these two conditions are sufficiently plain to enable any reasonably observant person to arrive at a correct conclusion. Following are some points of difference:—

1. In chilled brood the dead immature bees are in a compact sphere. In American foul brood the diseased larvæ are rarely, if ever, found in a compact sphere.
2. In chilled brood the dead inmates of the cells are usually in the pupal stage. In American foul brood the majority are in the larval stage.
3. In chilled brood the dead inmates can be removed easily from the cells, and the contents are watery. In American foul brood it is not easy to remove the diseased remains, and the contents are ropy.

4. In chilled brood the colour of the diseased remains is dark-grey. In American foul brood it is coffee-brown.
5. Any fairly vigorous colony will quickly clean up chilled brood. American foul brood cannot be cleaned up by the bees.

There is no treatment for chilled brood; the bees will clean the matter up and free the colony of the dead brood, but where bees desert a hive leaving brood to chill it is advisable—if there is any quantity of dead brood—to melt up the combs.

Starved Brood.

Where brood dies from starvation the dead larvæ are quickly removed from the cells by the bees. It may be noticed, too, that where a colony is suffering from a lack of food, the bees will uncap some of the sealed brood. Some of the immature bees may be seen in process of being removed. Their colour will be a healthy white, and they will be free of any symptom of disease.

Overheated Brood.

Overheated brood is usually caused by insufficient ventilation during very hot weather. Special attention should therefore be given to ventilation during the removal of bees. Careful note of the symptoms of chilled brood and a knowledge as to whether the colony has suffered from lack of ventilation will serve as guides for the apiarist. There is no treatment for overheated brood.

(*To be continued.*)

The Castration of Stock.

In castrating horses, cattle, pigs and sheep, of any age, it is preferable to cut through all the membranes surrounding the testicle at one stroke of the knife. This will usually result in cutting into the testicular substance itself, but that is of no importance. The muscular portion of the cord is then cut with the knife if the animal is large enough to warrant it, and the vascular part cut with the emasculator or écraseur or iron and clam. In smaller animals the whole cord is cut through with the instruments named, and in very young and small animals with the knife alone.—Veterinary Officers of the Stock Branch.

"I have about 7 acres of Rhodes grass, 3 acres of cocksfoot, and a few smaller lots of other grasses. Will you kindly let me know how to harvest the seed?"

The best method in the absence of special machinery is to cut and bind when the seed is beginning to shatter. Spread the dried sheaves on tarpaulin or a barn-floor and flail. Italian harvesters adopt the method of driving horses round and round the tarpaulin and treading the seed out. The seed can be cleaned with an ordinary winnower.—E. Breakwell, Agrostologist.

Cocoa Husks as a Fodder.

E. L. GRIFFITHS, B.Sc., Chemist's Branch.

In European countries large quantities of cocoa husks are used as fodder, both alone and in compound feeding cakes. However, recent happenings point to the fact that cocoa husks, if fed in excessive quantities, are likely to poison stock.

In 1916 it was reported from Germany that horses had been poisoned by feeding with cocoa husks at the rate of 2¼ lb. per meal (*J.S.C.I.*, 1918, p. 240).

In 1918 several army horses died at Mans in France. These horses had been fed on cocoa husks for four days at the rate of 1½ kilos (approximately 3 lb. 5 oz.) per horse per day. Their deaths were shown to be due to theobromine poisoning, and the investigators concluded—

(*a*) That cocoa husks were poisonous to horses, and

(*b*) That the sale of these husks should be regulated.

The cocoa husks contained 0·88 and 0·96 per cent. total alkaloids (*Annales de Falsifications*, 1919, p. 282).

G. H. Hansen (Experiment Station Record, U.S.A., 38·477, 1918) says of cocoa cake:—"It is to be noted that cocoa cake contains an amount of theobromine approximately equal chemically and pharmocologically to the caffeine content of coffee and tea. Laboratory experiments both with cocoa cake and theobromine on fowls, rabbits, and mice, led to the conclusion that, owing to its poisonous character, cocoa cake should not be used as a cattle food."

From feeding experiments on dairy cows carried out at Copenhagen, A. V. Lund (*C.A.*, 1919, 350) concludes that cocoa cake should be considered "rather as a poison than a fodder."

Mitscherlich (*Annales de Falsifications*, 1919, p. 282), administered 1 grm. theobromine to a pigeon, and the bird died in twenty-four hours. The same weight of alkaloid killed a rabbit in twenty hours.

The maximum dose for human beings (B.P.) is from 5 to 10 grains in the case of theobromine.

In veterinary practice caffeine citrate is recommended by W. S. Devoe, Gould's Medical Dictionary, in the following doses:—

Pig and sheep	...	...	...	...	IV to VII	grains
Dog ...	...	...	...	...	I to VI	,,
Horse	...	...	...	...	XV to XXX	,,

Analyses have shown a high percentage of oil of albumenoids, and a fairly concentrated nutritious food. The husks, however, contain an alkaloid (theobromine), consequently their use is not to be recommended

until further investigation is made. This investigation is now in hand. Reports from French sources indicate that poisoning may result from the use of cocoa husks, and a local poultry breeder has lost a number of ducks which were fed on a mash made with bran and cocoa husks.

The following are analyses of samples of husks and meal made recently in the laboratory of the Department, together with notes on their feeding-values:—

Cocoa Husks (unground).

Moisture ...	11·98 per cent.
Ash ...	8·22 ,,
Ether extract ...	4·40 ,,
Albumenoids ...	16·93 ,,
Fibre ...	12·47 ,,
Carbohydrates ...	46·00 ,,
	100·00 ,,
Nutritive value ...	72·83
Albumenoid ratio ...	1 to 3·2

Cocoa Meal.

Moisture ...	10·13 per cent.
Ash ...	8·34 ,,
Ether extract ...	5·46 ,,
Albumenoids ...	19·50 ,,
Fibre ...	13·89 ,,
Carbohydrates ...	42·68 ,,
Nutritive value ...	74·5
Albumenoid ratio ...	1 to 2·8

This is a concentrated food, and is used for feeding in other countries. The use of this food is not to be recommended, except in small quantities. Large quantities are to be avoided. It is, of course, quite a different substance from coconut oilcake, which is non-injurious.

Other analyses of cocoa meal have also been made, and have given similar results.

One analysis showed that the total alkaloids (theobromine and caffeine) present amounted to 1·2 per cent.

In one case some of this meal had been used in a mash for ducks, and heavy mortality ensued, as many as thirty to forty birds dying in a night.

Preserving French or Lima Beans.

To every 5 lb. of beans, after stringing and slicing, add ½ lb. sugar and 4 oz. salt. Place in cooking vessel, and cover with boiling water; boil for 25 minutes, place in jars while hot, fix rubbers, screw on tops, and place jars in warm water, covering to the tops. Bring to the boil and boil for 5 minutes; remove, screw down caps firmly, and cool off. Before using, the beans may be washed in warm water.

A little carbonate of soda added to the beans with salt and sugar allows them to retain a bright colour.—W. J. Allen.

Safeguarding Farm Stock from Disease.

(4) By the Use of Vaccines, Drugs, and Licks.

MAX HENRY, M.R.C.V.S., B.V.Sc.

Vaccines, &c.

For many years past veterinarians have made increasing use of vaccines and sera in the diagnosis, treatment, and prevention of disease. This work will without doubt, greatly increase in the future, particularly since in this country, for economic reasons, much greater efforts than in the past will be made to safeguard our live stock by every means in the veterinarian's power. Stockowners in Australia are well acquainted with the excellent preventive results obtained by the use of anthrax vaccine and what is known as pleuro-pneumonia virus, and they have also the knowledge that other diseases may be dealt with in the same manner. One unfortunate result of the popularity of vaccine treatment has been to encourage the belief that vaccines may be applied to almost any disease, irrespective of its cause and origin, and another is that unscrupulous persons have advertised various products of this nature in such a way as to hold out entirely false ideas of their power, and have even gone to the length of placing on the market so-called vaccines which are not biological products at all, and have no right to be so labelled. Such facts as these, however, should not deter us from making the fullest use of the preventive and remedial powers of many genuine vaccines and sera.

Vaccination against anthrax has proved its value, and the first step to be taken in an outbreak should be to arrange for the vaccination of all contact animals of any species. The same procedure should be adopted in the case of pleuro-pneumonia contagiosa of cattle, though in this disease only cattle are inoculated, since it does not affect other stock. In the latter instance great care must be taken that the virus used comes from a beast not affected with other diseases, and that it has been taken in a proper and cleanly fashion. Much of the loss of tails, and even of the mortality which at times has followed inoculation for pleuro-pneumonia, has been due to the use of dirty virus. Black-leg has in many parts of the world been controlled to a greater or less extent by the use of vaccines, and so has swine fever. With regard to some vaccines, and particularly that for the disease last-mentioned, it must be borne in mind that their use may create fresh centres of disease—hence they are not safe to apply generally; under certain circumstances they are strongly counter-indicated. None of the vaccines already mentioned are of any value as curatives, nor are most of those dealing with infectious diseases. Animals already attacked by the disease will usually succumb after vaccination.

In addition to these epizootic diseases, many outbreaks of pneumonia and other complaints of stock can be dealt with by vaccines made from organisms

concerned in the particular outbreak, and there is here a wide outlook for research and preventive work, could the veterinarian attending the cases work in conjunction with the veterinary pathologist. No doubt in the future this method will be adopted here as it has been in other countries. Such particular vaccines are by no means to be employed generally, and in the hands of unskilled and untrained men will do far more harm than good. They are of no value except in cases due to the particular organism from which the vaccine has been made.

The serum most in use is that applied against tetanus, and although at present its employment is practically confined to preventing cases in the horse, there is no reason why some of the serious sheep losses which occur after shearing should not be minimised by injections of anti-tetanic serum. Even if it is not worth while to treat flock sheep it should certainly be so with regard to stud animals.

Another group of biological products which have been of great value in the prevention of the spread of disease is represented by tuberculin and mallein. The former is widely used in the diagnosis of tuberculosis in cattle and by revealing early cases enables them to be dealt with, so preventing the infection of healthy stock. In the same way the horse stock of this country is protected from glanders by using mallein to test all horses brought into the country.

There is no reason why the use of these materials should not be extended to the enormous benefit of the stockowners of this State, and the fact that so little is used is evidence of the backward condition of this country in the application of veterinary science.

Drugs.

Of all the genuine methods which have as their object the prevention of disease, the administration of drugs, is, widely speaking, of least value. In one respect, that of preventing infection with wounds, they certainly have their place. Tetanus, blood-poisoning of various kinds, and other infections can be prevented largely by washing and cleansing wounds with proper disinfectants, though even in this case the cleansing is probably the most important factor. Disinfectants used at too great a strength may do more harm than good by killing the tissues to which they are applied.

The giving of purgatives and laxatives to healthy animals, with a view to keeping them in good health, is widely practised, and in most cases might just as well, or better, be left undone. It may at times be desirable to provide some laxative drug to stock on very dry feed, but if there is a possible choice between supplying laxative food and using a drug, the former should always be availed of.

Licks.

Licks are often used as a basis for giving drugs to large numbers of animals at a minimum expenditure of time and trouble. During recent years their employment has very greatly increased, and some rather staggering claims have been made as to their power to prevent disease. At times these claims are such as would hardly bear investigation.

The basis of most licks is common salt, and with this is given variable quantities of some common drugs. The value of licks in preventing disease is largely due to the fact that the salt eaten encourages appetite and probably aids in digestion. If Epsom salts is mixed with it the lick becomes of value in preventing constipation and may be so employed if laxative food is not available. Bone meal is of considerable value for stock in poor coastal country and other areas where lime and phosphates are not available in sufficient quantity from the soil, and despite statements which have been made to the contrary, there is no danger in its use, where the meal is properly prepared from the bones of healthy stock.

Sulphate of iron may be employed as a mild tonic and to counteract excessive succulence in the food, but being itself constipating, is not so suitable with very dry food. Other drugs are also employed, but usually in minute quantities.

In no case, however, can a lick properly replace good food, unless it itself contains a large proportion of such food, and in that case one might equally as well administer the food. Good food will do more to prevent loss from disease than all the licks put together. It appears to be a fairly wide-spread idea that a lick can be manufactured which will be of value under all and any conditions. As a matter of fact, the surrounding circumstances must be taken into consideration and a lick which would be of value during drought periods might be unsuitable during a flush season, while one suitable on the coast might not be so in the west. Finally, it is no good wasting money by giving drugs in the form of licks if the animals do not require them.

When Sudan Grass can be Cut.

Although the stage of greatest bulk and highest feeding value in the case of Sudan grass is when the plant is flowering, it is sometimes advisable to cut it earlier in order to ensure another full growth for hay or seed before winter. Sudan grass can be cut as soon as the head appears, for Sudan hay cut at this stage is not open to the objection, which obtains in the case of wheaten or oaten hay, that it has a scouring effect when cut earlier than the flowering period.—A. H. E. McDonald, Chief Inspector of Agriculture.

If the pig-keeper is to be successful in days of superfined tastes, he must systematise his industry through and through. The methods of pork production practised by our fathers are now of no avail, for there have been greater and more far-reaching changes in the public taste within the past twenty or thirty years than most of us will be ready, off hand, to admit; but it is just our ability to recognise such changes, and to alter our methods accordingly that lie at the basis of successful pig-feeding.—*Irish Farmers' Gazette.*

Pure-seed Growers Recommended by the Department.

The Department of Agriculture now publishes monthly in the *Agricultural Gazette*, a list of growers of pure seed of good quality of wheat, oats, maize, sorghum, Sudan grass, potatoes, and other crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

This list is compiled after inspection of the seed and report by a field officer of the Department (preferably during the growth of the crop), and farmers who have pure high-class seed of good quality of any variety of farm crop are therefore invited to communicate with the Under Secretary and Director, Department of Agriculture, Sydney.

The Department does not undertake to buy any of the seed, but recommends the grower by publishing his name in this list. The following list indicates where pure seed, recommended by the Department, is at present obtainable :—

Grain Sorghums :—	
Feterita	W. W. Hosking, Farm 778, Leeton.
Sweet or Saccharine Sorghums :—	
Saccaline	Manager, Experiment Farm, Lismore.
Wheat :—	
Bomen	H. M. Hall and Sons, Studbrook, Cunningar.
Canberra	R. J. O. Berryman, Botfield's Siding, *via* Bogan Gate. H. M. Hall and Sons, Studbrook, Cunningar. Taylor, Lloyd and Co., Adavale, Parkes.
Clarendon	J. Parslow, Collie road, Gilgandra.
Cleveland	W. Burns, Goongawarrie, Carcoar.
Currawa	J. Parslow, Collie road, Gilgandra.
Federation	H. M. Hall and Sons, Studbrook, Cunningar. J. Parslow, Collie-road, Gilgandra.
Firbank	J. Parslow, Collie-road, Gilgandra.
Florence	Manager, Experiment Farm, Trangie. J. Parslow, Collie-road, Gilgandra.
Hard Federation	J. Parslow, Collie-road, Gilgandra.
Penny	W. A. Graham, Rippingham Grange, Barellan.
Rymer	W. A. Graham, Rippingham Grange, Barellan. Taylor, Lloyd and Co., Adavale, Parkes.
Steinwedel	Taylor, Lloyd and Co., Adavale, Parkes.
Warren	Manager, Experiment Farm, Trangie.
Viking	Taylor, Lloyd and Co., Adavale, Parkes.
Yandilla King	H. M. Hall and Sons, Studbrook, Cunningar. W. R. Forsyth, Braeside, Wallendbeen.
Oats :—	
Guyra	A. J. Bassett, Carella, Nyrang Ck., *via* Canowindra.
Sunrise	R. C. Hopkins, Errowanbang, Carcoar. N. S. Meek, Hobby's Yards.
Grasses :—	
Paspalum	Manager, Experiment Farm, Lismore.
Sudan Grass	W. W. Hosking, Farm 778, Leeton. Department of Agriculture, Sydney.
Elephant Grass (roots or cuttings)	Principal, Hawkesbury A. College, Richmond Manager, Experiment Farm, Grafton. Manager, Experiment Farm, Lismore. Manager, Experiment Farm, Yanco.
Kikuyu Grass (roots)	Principal, Hawkesbury A. College, Richmond.
Clovers :—	
Shearman's Clover (roots)	J. H. Shearman, Fullerton Cove, Stockton.
Bokhara or Sweet Clover	A. Sommerlad, Hillcrest, Tenterfield.

It is especially desired at the present time to locate reliable sources of seed of Thew, Huguenot, Firbank, and Florence wheats, Sunrise, Ruakura, and Guyra oats, and Cape and Skinless barleys, the demand for seed of which for coastal green fodder far exceeds the visible supply.

Poultry Notes.

JANUARY.

JAMES HADLINGTON, Poultry Expert.

LOOKING back over the year just closed, it may be said that it has been one of anxiety for the poultry-farmer, not perhaps in so much as to what has actually happened, as to what appeared in prospect at the beginning of the year. Poultry foods soared in price to heights unprecedented since poultry-farming in this State has attained the status of an industry. The inevitable consequences have followed, and many small farmers have gone out of the business, while, except for returned soldiers' settlements, there have been but few accessions.

Thus has the high price of food resulted in higher prices for poultry products. True, some export trade in eggs has assisted to keep up the price of eggs, but it has not been the sole factor. Viewing the present position as a whole, the outlook for poultry-farmers was never better than at present. Let the farmer figure this out however he will, on present prices for poultry products and cost of feeding, and he must come to that conclusion. Whatever the troubles and difficulties of the past, the levelling up process has now taken place, and high prices for eggs and poultry seem assured for the next two or three years. In short, the industry has reached a stage when only low prices of foodstuffs extending over a couple of years, or a very marked decline in the consumption of eggs, can materially affect the prospects from that point of view. It amounts to this then, that nothing short of disaster in regard to our grain food supply is likely to mar the good prospects ahead for the poultry industry.

Watch the Chickens Grow.

Adverting to the lessons to be learnt during the rearing season, as mentioned in last month's notes, it will be a profitable experience for the novice poultry-farmer to note the check to growth that occurs in young stock during this and next month; also to study closely the different class of development occurring in stock hatched in the different months, from June onwards. Observation of these points will do much to dispel some of the illusions under which poultry-keepers labour in regard to the best months in which to hatch their chickens.

Fruit and Poultry.

As the summer fruit season is now upon us, it may be well to warn poultry-farmers in regard to the effect fruit has upon poultry. It is quite a common thing to hear expressions of opinion as to how well fruit-growing and poultry-farming go together. It is not my purpose here to go into this question from a mixed-farming point of view, but from a poultry-feeding standpoint.

It appears not to be generally known that too much fruit has a most injurious effect on poultry. Probably this is not so noticeable where poultry have a free range on an orchard and its surroundings, and where their owner runs them more or less as a side line, but the most disastrous effects are felt where birds are penned, and the waste fruit is fed to them in any large quantity, mostly with a view to saving the food bill.

The effect of fruit fed to poultry is so insidious that it is rarely noticed until the damage has been done. For instance, little or no enteritis might be in evidence, or no very pronounced symptoms of illness appear, hence it is that the trouble that occurs is not set down to the true cause sufficiently early to avert trouble.

When hens are fed fruit in any large quantity a falling off in laying is one of the first indications of trouble, but this is generally put down to some other cause, while the true explanation is not even thought of, the farmer being under the impression that if fruit is good for men and women it must be equally so for poultry. However, this feeding of fruit has cost many poultry-farmers dearly in loss of eggs alone.

Nor is this all. When fruit is fed to growing stock it is equally disastrous, for they fail to grow and put on flesh; in fact, they become so attenuated that many deaths often occur as a result. The probable causes of the trouble are two-fold: first, the acid contained in the fruit, and second, the fact that fruit contains little nourishment.

It follows, then, that even from an economy point of view the practice of feeding fruit is unsound, and from a production and growth aspect it is not advisable.

A Plea for Maize.

At the present time, by far the cheapest grain for poultry is maize. And while it is not contended that this grain should be fed exclusively, it is contended that up to half maize could be fed for the evening grain feed to advantage. In addition to the economy side of the question, in the light of combined scientific knowledge and practical experience it is about time poultry-farmers scrapped this old-time prejudice against maize as a poultry food. The idea that a fair proportion of this grain fed to poultry is too heating, and that it will make them too fat, is unsound. True, if the evening feed of wheat is suddenly changed to one of maize the laying hens will most likely fall off in production, but the cause of that is the change of food and not that the hens would not (if used to it) lay just as well on maize.

As a matter of fact, if the writer—while holding that mixed grain is much preferable to either wheat or maize by themselves—was by circumstances forced to feed on one grain only, and had the choice between wheat and maize, he would prefer the latter. This contention is based upon experience and supported by observation. Again, the food value of maize, weight for weight, is superior to that of wheat. Of the protein in maize 84 per cent. is digestible, while but 76 per cent. of that in wheat is so. The nutritive value of wheat is 83·5, while that of maize is 89, and this

is not all that makes a proportion of maize in the ration of poultry desirable. It is well known that the colour of the yolk of the eggs is largely influenced by the food, and that the yolk of maize-fed hens' eggs is very much higher in colour and richer than of those laid by wheat-fed hens.

What makes Sydney eggs, apart from freshness, more sought after by buyers than those from another State where wheat is fed almost exclusively, is that the yolks are a richer quality, which make them more valuable even for pastry cooks. Ask any Sussex-street agents who handle large quantities of eggs, and this fact will be attested to.

To come to matters of experience within the ken of all poultry-farmers of this State, is it not a fact that the highest tallies made in our Hawkesbury Agricultural College egg-laying competition have been made during the last few years, while receiving a portion of maize? It is not claimed that the improvement is due to the maize, but the figures point to the fact that hens fed on a proportion of maize more than hold their own. One-third of the evening grain feed at the College is cracked maize all the year round.

In regard to the question whether maize is best fed whole or cracked, the latter is much preferable, and particularly for hens in confinement. Adult birds run on free range appear to do fairly well on whole maize, but for all growing stock it should be cracked. The value of maize for this class of stock should be recognised by all farmers.

Experiments with Tomatoes.

A recent bulletin issued by the Kentucky (U.S.) Experiment Station gives a summary of results from experiments carried out with tomatoes to determine the effect of various methods of pruning and staking on the yield, earliness of ripening and size of the individual fruits. From the results of three seasons' work, the author found that pot-grown plants were much more productive than flat-grown plants. Staking and pruning reduced the yield of marketable fruit per plant, but increased the yield per acre because of the greater number of plants that it was possible to set. Generally speaking, the yield per plant was in direct proportion to the number of bearing stems. On the whole, pruning to two stems gave the best results.

Pruning increased the size of the individual fruits, and pruned and staked tomatoes ripened approximately one week earlier than those that had been untrained. Plants trained to two stems, set 2 feet x 4 feet apart, yielded less per plant but much more per acre than similar plants set $4\frac{1}{2}$ x 5 feet apart and also more per acre than untrained plants set $4\frac{1}{2}$ x 5 feet. A range in length of stake from 4 feet 2 inches to 5 feet 6 inches had little effect on the total yields.

The writer concludes that it does not pay to stake and prune tomatoes for the canning factory, although it may pay in the home garden or in very intensive trucking areas. The cost of stakes, the additional labour involved, and the greater number of plants required may be the limiting factors for profitable staking and pruning.

Orchard Notes.

JANUARY.

W. J. ALLEN and W. le GAY BRERETON.

Cultivation.

THE copious rains that have fallen during December will have caused solidifying of the soil and much weed growth in many localities. For this reason it will be necessary again to get the ground into good loose condition, and to kill the weeds as soon as possible, so that if a dry spell should set in the fruit which ripens later will not suffer, and so that, in any case, the trees will have every opportunity to complete the formation of well-filled fruit buds for the following year. In some cases the weeds may have got too far advanced to be dealt with by the cultivator, and it will be necessary to use the plough. In the lighter soils, a light multiple plough can be used which allows the work to be put through expeditiously. It will also be necessary to use hoes around the butts of the trees to deal with the weeds that cannot be reached by the plough or cultivator.

After so much rain, one is liable to think the land will never dry out again, and to neglect the cultivator, especially in orchards where there is a lot of late fruit to handle.

Budding.

The sap should be running freely, and the present month is a good time to bud either established trees or nursery stock. Whatever variety is being worked, in all cases select wood for budding from trees that have proved reliable croppers of a good type of fruit. Established trees that were cut back at the end of last winter, or early spring, will probably have thrown more shoots than necessary for the base of the new framework, and it is advisable to bud more than will be actually required, to allow for losses by wind or other accidents. When large trees have been cut down below the crown for the purpose of budding, young wood will be thrown out during the growing period. It is also advisable to encourage young wood around the stem, in order to bring about an equal and continuous flow of sap. If it be found that the young shoots are too numerous, some of them should be cut hard back, and the remainder budded, so as to ensure in the future a well balanced tree.

Summer Thinning and Training.

Trees that are over-thick in foliage can have some of the heavier shoots removed where there are more than will be required for next season's leaders, and if this does not open up the tree sufficiently some of the lighter wood may also be removed. In districts subject to brown rot, and if the weather is wet, such treatment assists to some degree to check the disease.

Well-grown apple and pear trees that have shown tardiness in spur development might have the current season's lateral growth shortened at the end of this month. With varieties such as Rome Beauty these can be shortened right back to the cluster buds near their base, but in some varieties these buds are quite blind, and more length should be left.

Trees that have been previously re-worked should be watched, and any growths from the old stumps or stock that are retarding the growth of the grafts or buds should be checked back or removed.

Harvesting.

In the coastal districts, where chiefly early stone fruits are grown, the grower will be through the bulk of his marketing by the end of this month. The apple and pear grower of the tablelands, on the other hand, will only just be entering on the bulk of his harvest. The inland grower, who produces late stone fruits and grapes, will also have much fruit to handle.

In all cases the fruit should be picked in the early morning, before it has warmed up. In no case should it be packed while it is in a hot condition. Great care should be exercised to avoid any rough handling and consequent bruising. As the supply of fruit is likely to be heavy, extra care should be taken in the grading. If provision has not already been made for an ample supply of cases, this should be attended to.

The main drying peaches will be ready toward the end of this month. In operating on this fruit the notes given on apricot drying last month can largely be followed, but the peach should be exposed for a rather shorter time to the sulphur fumes. The sulphur causes the cut flesh to sweat and show beads of moisture, but does not fill the cup as with the apricot If it is desired to peel the peach, the fruit is put cup downwards on the tray; then, after sulphuring, the skin can be pinched off without shifting the position of the fruit. Fruit that has been picked at all under-ripe for drying will not peel in this way. Growers as a rule have not found the increased price for peeled dried peaches sufficient to pay for cost of peeling and loss of weight. Farmers' Bulletin, No. 52, "Fruit Drying," is procurable from the Government Printer, Sydney, price 10d., post free.

Pests.

If codlin moth has been at all bad, late hanging apples and pears should have an extra application of lead arsenate. It is in these late applications that soap as a spreader is especially useful, but it is essential that such a mixture should be used immediately after being mixed. Laboratory trials have shown that the addition of soap renders some of the lead arsenate soluble, which introduces a possibility of burning, but extensive field trials have not yet been attended by a single case of the kind. If soap is used as a spreader, an additional amount of arsenate of lead will be found beneficial; the additional rate should be 1 lb. per 100 gallons of water. If woolly aphis is present, a tobacco wash or a commercial tobacco extract, free from soda or any substance liable to upset the lead arsenate, may also be added as explained in these notes for October.

Every effort should be made to collect regularly and destroy by boiling or burning any infected fruit. Where citrus are badly affected and showing distress from scale, they can be fumigated or sprayed toward the end of this month, but where possible it is better to delay this work until later, as there is then a better chance of catching more eggs after hatching.

Fumigation has for many years back proved by far the most efficient treatment for all scale insects attacking citrus trees, but where fumigation is not practicable resin soda is the best spray known by the Department for red or black olive scale. It will also kill white wax, but if only wax be present the soda spray alone (which is far easier to mix and apply than the resin soda) is sufficient. In dealing with scale on citrus the main thing is to allow as many of the eggs to hatch as possible, but not to allow those that hatch the earliest to grow too big and develop their protective covering too much. Thus at this season of the year the trees should be closely watched and action taken when it is judged necessary.

Where white louse is starting to spread up toward the main limbs it should be dealt with at once, as at this stage winter strength lime-sulphur can be used effectively without danger of it getting on the foliage. Once the louse gets out on the smaller wood carrying the foliage, it is almost impracticable to apply the lime-sulphur strong enough to kill the louse without injuring the foliage. In the latter case fumigation is the only effective treatment.

The Loganberry.

Good reports have been received this season regarding loganberries, and there are many parts, especially in the coastal areas not too far from the markets, where this fruit could receive more attention.

Though the plant is hardy and is not over particular as to the soil, moisture must be assured if good crops are to be obtained, as the fruit fails to develop during a dry spell. The fruit is also very susceptible to hot winds.

The plant is a gross feeder, and like the passion vine the best results will not be obtained unless attention is paid to manuring. Where sufficient farmyard manure is obtainable nothing better can be used, but where its use is impracticable bonedust or blood and bone give good results. The addition of a potash fertiliser might be tried, but should not be adopted until such trials for individual localities have proved beneficial.

Effects of Milk Recording in Scotland.

Among other advantages, milk recording tends to more thorough milking out of the animals, with the consequent stimulus to greater production, as owners and staffs alike where herds are regularly tested are more anxious to obtain creditable results. Interest in the cows generally is increased, and more is done in various directions to obtain the maximum milk yields.—*The Scottish Journal of Agriculture.*

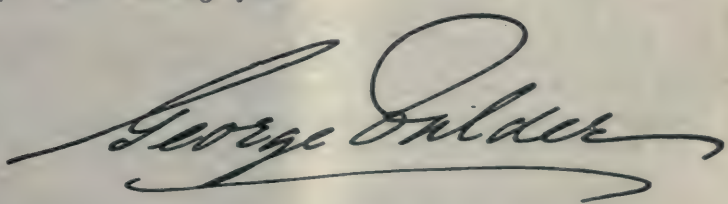
Agricultural Bureau of New South Wales.

Greetings for 1921.

IT affords me pleasure to congratulate the members of the Agricultural Bureau on the enhanced interest taken in the movement during the past year. Some few new branches have been established, and there has been a manifest increase in activity and usefulness in many others. The reports of the meetings, which appear in the "Agricultural Gazette" from time to time, indicate the manifold usefulness of the institution to farmers.

The return to duty of many field officers who had been on active service has enabled the Department to take a much more real part in the work of the Bureau, and much has also been gained by the return to their homes of many young farmers who, during their absence in Europe, had had opportunities of seeing the methods adopted there—some even of attending oversea training institutions. The ultimate effect upon the agriculture of the State of this infusion of new ideas should be highly significant, and the Bureau is a most important medium for their dissemination.

The year upon which we are entering has every prospect of being a good one, and it is with the greater pleasure, therefore, that on behalf of the Minister for Agriculture and the staff of the Department I offer to all members of the Bureau seasonable greetings and the best wishes for the coming year.



Under Secretary and
Director of Agriculture.

Sydney, 3rd January, 1921.

Agricultural Bureau of New South Wales.

SUGGESTED SUBJECTS FOR BUREAU MEETINGS.

It sometimes happens that, owing to some inadvertence, members of branches meet without having any particular subject before them. In such a case one of the following paragraphs may provoke a useful discussion, and a brie report of the discussion will often interest other branches.

Do you practise summer cultivation of land fallowed for next wheat crop? Have you found that it conserves moisture, or is it for some other reason that you do it? Do you find it interferes with other farm work at this season of the year?

What methods have you found best for keeping seed maize free from weevil and grain moth?

What method do you adopt for classing your wool clip? How many classes do you make, and what distinctions do you observe in the work? What is your practice in branding and baling? Have you found it necessary to amend your methods in this respect in recent years; if so, why?

What has been your experience in the feeding of chickens this past spring? Did you feed on wet mash, dry mash, crushed dry cereals, or a combination, and what have been the results as to development and percentage of losses?

How often do you find it necessary to cultivate the surface soil in the orchard during the summer? In many orchards the area hand-hoed is so great as to be an expensive item. Have you tried any horse-power implement for working closer to the trees; has the result been satisfactory as to the soil, and what has been the actual saving?

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, the Department does not necessarily endorse the opinions expressed.

Auburn.

At the meeting of this branch on 13th November, Mr. Anderson, of the Lidcombe branch, delivered a lecture on flower and vegetable gardening. He dealt with methods of propagation of bulbs, cuttings of roses, vines, &c., germinating seeds, and herbaceous grafting.

Mr. Anderson was accompanied by the Chairman, Vice-chairman, and several other members of his own branch, and the evening convinced the Auburn members of the value of such exchange visits.

The branch is offering a prize, valued at 10s., for the member who introduces most members during the year, with a minimum of ten members or no prize.

The monthly exhibition of vegetables attracted an interesting collection. One member brought a cabbage so large that it had to be carried in a clothes basket, and his other exhibits included beet and pumpkins of creditable sizes. Flowers were also forward in good numbers.

Borenore.

At the monthly meeting on 3rd November, Mr. E. Breakwell, B.A., B.Sc., delivered a lantern lecture on weeds and grasses that was much appreciated by hearers.

Weeds and Grasses.

The cool and long winter allowed introduced grasses to thrive better there than in most parts of the west. Good paddocks of rye grass, cocksfoot, and Kentucky blue were very noticeable in a good season. Rye grass was considerably affected by dry weather, and after a long spell it was invariably found that cocksfoot alone survived. The latter then became tussocky and coarse, and was not relished nearly as much as when it grew in a mixture. A good winter grass was much needed for the district, and *Phalaris bulbosa*, which was doing well at Orange, was mentioned as likely to be suitable. Other winter grasses that were giving good results were Tall Oat grass (*Avena elatior*) and Giant Fescue (*Festuca arundinacea*.) It was bad policy to grow grasses alone if a clover could be found to grow with them, and a strain of Perennial red clover had been found to produce good results. To this might be added the possibility of another clover known as Bokhara or Sweet clover. The latter was very much like lucerne in its early stages of growth, with a very deep root system and heavy leaf growth. It would, however, grow much more readily in certain soils than lucerne, and, owing to its heavy seeding qualities, would last and even spread in a pasture where lucerne failed to do so. A good mixture to be recommended for Borenore would be 4 lb. *Phalaris bulbosa*, 6 lb. of cocksfoot, and 5 lb. of Bokhara clover per acre. An alternative very fair mixture would be 4 lb. Chilian clover, 8 lb. of Perennial rye grass, 6 lb. cocksfoot, and 6 lb. of Giant Fescue per acre.

The value of Sudan, Elephant, and Kikuyu grasses was also mentioned, after which the lecturer proceeded to deal with the native grasses, urging judicious stocking, resting, and subdivision of paddocks as means of maintaining the most desirable grasses.

Castlereagh (via Penrith).

At a meeting on the 29th October, Principal H. W. Potts, Hawkesbury Agricultural College, delivered a lecture on the cow and her milk.

Mr. Potts dwelt on the industry as a whole, showing what possibilities there were in dairying if carried out in a scientific manner, and giving figures to show the marvellous growth of the industry during the last twenty-eight years. He indicated that the bull was half the herd, and a farmer was unwise to purchase any but a pure-bred, with a pedigree running back at least three generations on both sides to show that he came of good milk-producing stock.

White scour in calves was next touched on. Till a few years ago disease carried off at least 20 per cent. of the poddies. After explaining how thoroughly they had gone into the matter in America, eventually discovering the cause, Mr. Potts said the only cure was sunlight. All old sheds and feeding stalls must be pulled down and the calves allowed to bask in the sun all day. This had the desired effect, and during the last four years at the Hawkesbury Agricultural College not a single calf had been lost from this disease.

Many questions were put to the lecturer, and the meeting closed with a vote of thanks to Mr. Potts, who promised to come at some future date and speak on bacteriological subjects.

Coradgery.

The annual meeting was held at Mr. W. E. Tayler's residence, Adavale, on 27th October. The report and balance-sheet showed a year of useful activity. The election of officers resulted thus:—Chairman, Mr. W. E. Tayler; Vice-chairmen, Messrs. G. Tanswell and A. Milgate; Treasurer, Mr. H. N. Marriott; Hon. Secretary, Mr. J. Clatworthy.

During the afternoon Mr. J. Clatworthy, on behalf of the members of the branch, presented to Mr. Tayler a punch bowl, water jug, and fruit dish in cut glass, in recognition of his valuable services to the branch. It was largely because of his enthusiasm that the branch had managed to keep alive during the past two seasons. The whole district had benefited by the activities of the branch. The visits of Departmental

officers had wakened farmers up in connection with sheep and with wheat. A few years ago it was difficult locally to secure good seed wheat, but now from their own members they could obtain graded wheat of all the principal varieties, equal to anything grown in the Commonwealth.

Mr. G. Tanswell heartily endorsed the testimony as to the value of Mr. Tayler's work for the branch, and in acknowledging the gifts Mr. Tayler indicated his keen appreciation of the honor done him, and attributed the success of the branch to the activities of the various secretaries.

Cordeaux-Goondarin.

A meeting of the branch was held on 30th October, when Mr. G. H. Walker read a paper entitled "Winter Crops" of which a summary follows :—

Hairy vetch was spoken of as a poor land crop, but the hay carried as much protein as bran. The flower did not stand frost well, and that must be considered when planting for seed. The crop was especially suitable for growing with cereals, such as rye and oats. Then followed results of crops on various plots.

Planting from February to April was advocated to enable the winter crops to be got off in time for a summer crop following. The only way progress could be made was to produce more and to conserve what we already have, especially in the way of stock.

At the monthly meeting, on 25th November, Mr. Cowain read a paper, of which a summary follows :—

Experiences of Spraying.

There were three essentials to success in orchard work—(1) cultivation, (2) pruning, (3) spraying. Unless the last was done thoroughly and at the correct time, the benefit of the first two would be lost. He advocated the use of miscible oils for winter and early spring for woolly aphis and San José and mussel scales. He had absolute faith in lime-sulphur solution. He had cleaned scab from Carrington and Granny Smith trees with it. The most important times for its use was (1) when the cluster buds were opening, and (2) at the petal-fall stage. At the latter spraying arsenate of lead and tobacco wash might, if necessary, be added.

Bordeaux mixture was considered equal, if not superior, to lime-sulphur. Freshly burnt lime should be used, but was not always obtainable. He worked on the formulæ of the Department of Agriculture and had had good results from them. He had proved each spray to be thoroughly effective if made and applied as directed.

Another paper on crops growing in the district was read and attentively listened to.

Cotta Walla.

The above branch met on 26th October, when Mr. A. J. Pinn, Inspector of Agriculture, lectured on potato culture.

Potato Culture.

Mr. Pinn commenced with an interesting account of potato growing as he had seen it in the Channel Islands and Great Britain. The value of selection of seed was indicated, and the remarkable improvement made in America with the crop was pointed to; the yield of one variety had been doubled in eight years by these means. Improvement by selection could be accomplished either by the tuber method (which consisted of selecting the best tubers), or by the hill method (which consisted of choosing the best hills, and planting the tubers separately each year). He preferred the second method as giving the best results. It was the invariable rule of potato-growers to plant the small tubers, for they were the more economical and gave the better germination, but they lowered the standard of the crops. The first root dug, perhaps, would have four marketable potatoes; the second root dug might have one for market, and the remainder seed size; the third root might be all seed size. The product of the best root would thus be sold, while the product of the worst root would be planted the following year. Was it any wonder the standard of varieties of potatoes degenerated?

The importance of good cultivation and of manuring was also urged. Grading was also advocated, the experience of New England growers being mentioned in this connection.

Dural.

On 26th November several subjects were very usefully discussed.

Improved Yellow Dent maize sown early for early fodder crops, and Hickory King, for good growth and milky cob, before Christmas, or when moisture was available, were regarded as useful for general sowing.

Undiluted wood oil, painted on fowl houses, had given good results as a preventive of lice, and certain miscible oils, with 50 per cent. water, had also been found effective.

Granny Smith and Cleopatra apples had been found most affected with bitter pit, and cultivation had not been observed as acting as a preventive.

Lime-sulphur spray mixture was made by a number of growers by various methods, but chiefly on the Departmental formula, and was tested for specific gravity to avoid damage to trees and also extravagance by the use of too great a strength.

Garra-Pinecliff.

The annual meeting of this branch was held at Mr. H. Robards' residence on 28th October. The secretary's report showed that the year's work had been satisfactory, considering how trying the season had been. The treasurer's balance-sheet showed that there was a useful credit balance.

The election of officers resulted thus:—Chairman, Mr. W. Forrester; Vice-chairmen, Messrs. H. Robards and S Bradley; Treasurer, Mr. S. Robards; Hon. Secretary, Mr. S. W. Packham.

It was decided to make an effort to stage an exhibit of produce grown by members at the next Molong Show.

Glenfield.

At the meeting on 16th November, Mr. A. Blinman, Chairman, read a paper on vegetable growing. He stressed early and thorough preparation of the soil, and recommended plenty of farmyard manure to be spread over the ground; blood and bone should be applied in drills when planting.

Glen Innes.

At a meeting on 4th December, a discussion took place on sorghums and millets. Mr. H. Osborne was in favour of Early Amber cane, *Sorghum saccharatum*, Hungarian miliet, and Sudan grass for the district. Mr. Farlow agreed, but preferred Japanese millet to Hungarian millet on account of it being a heavier cropper, though he admitted it took longer to mature. Mr. Spatch was a believer in Early Amber cane. Mr. Morton had tried Saccaline, but the season here was too short, an experience that corresponded with that of Mr. Osborne.

Henty.

A paper was read by Mr. F. A. Schultz on incubation at the meeting of 18th September. He remarked that the hen that got away by herself and hatched her brood under a woodheap or in a haystack, always got the best results. Artificial incubation was fully dealt with, valuable suggestions being made, and several questions answered.

At a further meeting on 13th November, a discussion took place on methods of preventing diseases and pests in fruit trees.

Mannus.

At the November meeting Mr. C. Pedersen, dairy instructor, gave an interesting lecture and lantern display on dairying subjects.

The lecture indicated how a dairy herd could be improved, stress being laid on the necessity for the sire coming from a strain of proved heavy milkers—and not for one generation, but for several. The dairy farmers, too, must go in for pure strains of cows, not for crossbreds.

Herd-testing was also touched on. It was about the only way of finding out the profitable and unprofitable cows, and every dairy-farmer should adopt it.

Mittagong.

A very successful meeting was held on 9th November, when the election of officers resulted thus :—Chairman, Mr. A. E. Boswell ; Vice-chairmen, Miss Barker and Mr. E. P. Furby ; Hon. Secretary and Treasurer, Mr. A. Shimmels.

Mr. A. E. Boswell, orchardist at the Farm Home for Boys, Mittagong, then read a paper on insect pests, from which the following is extracted :—

It is just as essential that the orchardist and the farmer should study insect pests, their habits, and the means for the eradication, as that he should have a knowledge of the science of cultivating, pruning, spraying, &c. A study of entomology—that branch of zoology that treats of insects—will enable the intelligent orchardist or farmer to identify the various insects and distinguish between their power for evil or good. He will, moreover, be in a position to recognise any new variety, whether it be beetle, moth, spider, or grasshopper. With a knowledge of its life history, its means of propagation, methods of feeding, &c., he will be able to adopt means to combat it. Even those with an elementary knowledge of insect life are aware of the stages through which an insect generally passes, viz. :—1st, egg ; 2nd, larvæ, as caterpillar, grub, or maggot ; 3rd, chrysalis, after the feeding stage ; 4th, perfect insect, after a period in which it has remained dormant, in the form of moth, fly or butterfly. Usually the life of the perfect insect is short, amounting sometimes to only a matter of hours, during which it does not feed but confines its attention to the perpetuation of its species by depositing eggs. Acquaintance with the various kinds of insects, acquired by practical study of them in their different manifestations, is of the greatest importance to the man on the land. The study of them cannot begin too soon, and the matter is of sufficient importance to warrant a systematic course of instruction in the primary schools.

Mr. Boswell then proceeded to deal with the codlin moth as the most conspicuous insect of the "chewing" kind.

Mullumbimby.

The members of this branch met on 27th November, when several subjects were usefully discussed.

Quakers' Hill.

At a meeting on 18th November, a discussion took place on potato-growing and varieties, being provoked by samples of different varieties brought by Mr. S. Pye to the meeting. Mr. J. J. Pye also produced some coloured maize which attracted attention, and after inspection the grain was distributed as seed. The discussion was regarded as a profitable one.

Rydal.

On 30th October Mr. A. W. Burgess read a paper on local products that was heard with interest.

Some Local Agricultural Products.

Potatoes, peas, and turnips were three profitable crops that he found worked well together

The Potato.—For this crop he preferred granitic country. Soil of this nature, covered with bracken, although difficult to put into good order, would stand cultivation for a long period. Black flats, in comparison, were liable to cake in dry weather or hold too much moisture in wet seasons. Sandy soil became infested with sorrel and produced light crops. He favoured ploughing seven or eight inches deep, and harrowing early in winter.

As to varieties, Manhattan did well in heavy soil, but was not a good seller. Freeman usually grew very large and hollow; if planted thickly, a smaller potato would result. Early Rose and Satisfaction had given best results. Satisfaction should be planted towards the end of November, say 15 inches and 3 feet apart. By planting late they would avoid potato-fly, usually prevalent in the early part of the year. Early Rose should be planted in December, as late planting would prevent second growth, to which this variety was subject.

Mr. Burgess generally used cut seed, with two eyes on each set, and about 8 cwt. seed per acre. After planting, he harrowed the land down and again used the harrow when the plants were about four weeks old to break the crust which formed. Afterwards he used the scarifier when necessary.

He stored in a shed in preference to pitting. Small potatoes could be fed to cattle or pigs with good results if boiled.

Peas.—These did best on land that had grown a crop of potatoes. They needed good cultivation. The land should be ploughed 7 inches or 8 inches deep and harrowed, and then allowed to lie fallow through the winter. He commenced planting about the beginning of September and planted at intervals of a week or so till New Year's Day. Plough very shallow in September, as it is not wise to plant deep at that time. As the season advanced they should plant in deeper drills according to the depth of the moisture. He used 1½ bushels of seed per acre, in rows 2 feet 6 inches apart.

After the vines were about two weeks old he used a light harrow to break the surface and so keep the moisture about the plants. As they grew older he used a scarifier frequently and kept weeds cleaned out. Picking should commence as soon as pods were filled. The crop should not be packed in a heap, as they would sweat very quickly and turn white.

Yorkshire Hero, which was found the best suited to the district, grew on small vines, and was a very hardy variety. It matured in about fourteen weeks. The pods filled well, and in normal seasons produced about 150 to 200 bushels per acre. Another variety used, Stratagem, required a long season (18 weeks) to grow to maturity. This variety grew pods 5 inches long on a heavy vine. Senator, a new variety in the locality, yielded about 200 bushels per acre.

Turnips.—He had found Purple Top Swede best suited to the district. On good clean soil he sowed about 2 lb. seed per acre broadcast. If weeds were likely to appear, the seed was best sown in drills to allow room for cleaning.

The best time to sow was early in January, in damp weather. His practice was to plough and harrow the land; then plant the turnip seed on the surface and harrow in, covering very lightly.

Discussion.—An interesting discussion followed respecting different varieties of potatoes and peas grown in the locality, and the suitability of certain soils.

In reply to questions, Mr. Burgess stated that turnips planted in January had yielded 7 tons per acre at £18 per ton. Taking various seasons they had averaged £70 per acre. They were also splendid cattle feed in winter.

Peas had averaged about 5s. to 6s. per bushel, though occasionally much higher, and yielded about £20 to £30 per acre. The seed cost about £3 per acre, and the cost of picking was 1s. 6d. (eighteen pence) per bushel. Loamy loose soil was desirable. Black flats were not desirable for peas in wet seasons.

Potatoes had yielded 4 to 6 tons per acre in new ground—without manure or fertiliser. He generally adopted a rotation of potatoes, peas, and oats.

Departmental Note.—The average of £70 per acre from turnips is an excellent one, but too high for average conditions.

The members met again on 27th November, when Mr. J. D. Gardiner read a paper on the sheep suitable for the Rydal district. He had found strong wool merinos best suited to the locality, preferring that type to either fine merino or any crossbred. They were more profitable and resisted disease better. He had been very successful in treating sheep affected with fluke

and worms by drenching with a mixture consisting of one desertspoonful of turpentine and two of milk. He gave three doses at intervals of two or three days. Stockholm tar added to Liverpool salt (1 pint tar to 20 lb. salt) made a very good lick.

Tingha.

The monthly meeting was held on 6th November, when arrangements were made for representatives to give evidence before the Legislative Council's Select Committee on Agriculture. A request from Guyra for co-operation in arranging a district exhibit for the next show was favourably considered.

Before the meeting closed, the Chairman, Mr. G. W. Browning, on behalf of the members, presented to Mr. M. C. Levitt a Rotherham watch as a token of appreciation of his services to the branch in the capacity of Hon. Secretary. Mr. Levitt had had to relinquish his post in consequence of ill-health, and members were very sensible of the important part he had played in the success of the branch. In addition to Mr. Browning, Messrs. Vickery, Hawkins, and other members testified to the value of Mr. Levitt's services, and trusted his recovery would be early and complete.

On 20th November, Mr. W. le G. Brereton, Assistant Fruit Expert, gave a demonstration of summer thinning at Mr. Robilliard's orchard.

Summer Thinning.

The name, summer thinning, covered a number of operations, starting in spring and continuing through the season. The earliest work was with the young trees, and was for the purpose of forcing out fresh leaders, and so getting the frame-work more quickly built up. With older trees the aim was to try to do away as much as possible with summer thinning, for this operation came at a time when the orchardist's hands were full of other work. In winter, the pruning shortened back the year's growth with a view to forcing out several strong eyes to allow a choice of leaders. The top eye generally came away the strongest, the eyes weakening lower down the stem. It was often found that when the top eye took the right direction, the next was in the wrong, while the third, though right, was not sufficiently strong to make a satisfactory leader. This was especially so in the apple and the pear. To overcome this early in spring they should rub out the second leader, and so give the third a better chance. If rubbed out during the winter the gap had a tendency to cause uneven growth, because the sap had found a difficulty in passing the gap, so that the top bud was robbed, other undesirable buds receiving the supply of sap.

Mr. Brereton proceeded to demonstrate the treatment of peach, plum, apricot, and apple trees, and gave valuable suggestions on other subjects as the condition of the trees afforded opportunity.

At a meeting on 6th December arrangements were advanced for the third annual exhibition, to be held on 18th and 19th February. A lengthy prize list has been prepared.

Toronto.

At a meeting on 2nd November, Mr. H. Filmer dealt with propagation of plants by seed. The schedule of the show, to be held on the 15th January, was circulated, and arrangements for the event were further considered.

Walla Walla.

The ordinary meeting was held on 30th October, when a discussion took place on the starling pest, correspondence from South Australia being read on the subject.

Wetherill Park.

At the meeting on 17th November, the resignation of Mr. A. J. Hodges, who has been secretary to the branch for several years, and who is now leaving the district, was received with regret, and with an expression of thanks for his valued services. Mr. C. J. Brown was elected to the vacancy.

A discussion, which proved helpful to members, took place on black spot in tomatoes.

Wentworthville.

At the meeting on 24th November, Mr. A. A. Ramsay, Principal Assistant Chemist, delivered a lecture on the preparation of the soil and manuring. Ploughing, harrowing, and cultivating were dealt with, the importance of producing a good tilth being indicated, especially if the best results were to be obtained from manuring. The essentials of plant growth were mentioned, and green manuring and the saving and use of stable manure advocated.

Windsor.

A meeting was held on 22nd November, when various business was dealt with. It was agreed to approach the Railway Commissioners on the subject of freight charges on fruit.

Yarramalong.

The annual meeting was held on 23rd November, when the following office-bearers were elected :—Chairman, Mr. J. L. Ellis ; Vice-chairman, Mr. C. Waters ; Treasurer, Mr. J. Bailey ; Hon. Secretary, Mr. E. Hodges. The balance-sheet showed a credit of £4 17s. 8d.

Yarrunga-Avoca.

At a meeting on 25th September a discussion took place on the cost of producing cabbages. One grower supplied the following from his actual experience :—

	£	s.	d.
Ploughing (three times), at £1 per acre	3	0	0
Harrowing (twice), at 5s. per acre	0	10	0
Plants, at 8s. per 1,000—7,500 per acre	3	0	0
Manure—17 cwt. blood and bone per acre, at £12 per ton ...	10	0	0
Labour for planting—Two men for 2½ days, at 10s. per day ...	2	10	0
Chipping—One man for 2 days, at 10s. per day	1	0	0
Scarifying (once)...	0	10	0
Cutting and loading	5	0	0
Carting to rail, £1 per ton, 16 tons	16	0	0
Freight on rail	12	8	0
Cartage from Darling Harbour to the Markets	4	16	0
Market dues	1	4	0
	£59	18	0

The cabbages realised £175, less £13 2s. 6d. commission, so that the profit was at the rate of £101 19s. 6d. per acre.

On 30th October a very successful picnic was held by the branch, members and friends to the number of 100 journeying to Fitzroy Falls. A most enjoyable day was spent, and at lunch time, Mr. C. Wright presiding, several toasts were honoured.

Opportunity was taken by Mr. C. C. Crane, Organising Inspector, to state the advantages of membership of the Bureau, and to indicate how the Department of Agriculture serves farmers generally, and Bureau members particularly.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1921.

Society.	Secretary.	Date.
Albion Park A. and H. Association	H. R. Hobart	Jan. 14, 15
St. Ives A. and H. Association	A. K. Bowden	,, 14, 15
Gosford District A. Association	H. G. Parry	,, 21, 22
Kiama A. Society	G. A. Somerville	,, 25, 26
Nimbin A. and I. Society	W. P. Stanger	Feb. 2, 3
Wollongong A., H., and I. Association	W. J. Cochrane	,, 3, 4, 5
Cobargo A., P., and H. Society	T. Kennelly	,, 9, 10
Shoalhaven P. and A. Association (Nowra)	H. Rauch	,, 9, 10
Central Cumberland A. and H. Assoc. (Castle Hill)	H. A. Best	,, 11, 12
Ulladulla A. and H. Association (Milton)	R. F. Cork	,, 16, 17
Guyra P., A., and H. Association	P. N. Stevenson	,, 16, 17, 18
Fairfield Branch Agricultural Bureau	H. P. Godfrey	,, 17, 18
Blacktown and District A. Society	J. McMurtrie	,, 18, 19
Wyong District A. Association	E. H. Chapman	,, 18, 19
Dapto A. and H. Society	F. James	,, 18, 19
Luddenham A. and H. Society	C. C. Wallace	,, 18, 19
Bangalow A. and I. Society	W. H. Reading	,, 22, 23
Yanco Irrigation Area Agricultural Society	R. Tribe	,, 22, 23
Robertson A. and H. Association	E. S. Martin	,, 22, 23
Southern New England P. and A. Association (Uralla)	H. W. Vincent	,, 22, 23, 24
Dorrigo and Guy Fawkes A. Association	A. C. Newman	,, 23, 24
Gunning P., A., and I. Society	S. A. Beer	,, 23, 24
Newcastle A., H., and I. Association	E. J. Dann	,, 23 to 26
Hastings River A. and H. Society (Wauchope)	A. D. Suters	,, 24, 25
Nepean District A., H., and I. Society	C. H. Fulton	,, 25, 26
Tamworth P. and A. Association	J. R. Wood	Mar. 1, 2, 3
Tenterfield P., A., and M. Society	E. W. Whereat	,, 1, 2, 3
Manning River A. and H. Association (Taree)	R. N. Stow	,, 2, 3
Mirrool (M.I.A.) A. Society (Griffith)	F. A. Browne	,, 2, 3
Richmond River A., H., and P. Society (Casino)	P. M. Swanson	,, 2, 3
Tumut A. and P. Association	T. E. Wilkinson	,, 2, 3
Taralga A., P., and H. Association	J. J. Kearney	,, 2, 3
Oberon A., H., and P. Association	C. S. Chudleigh	,, 3, 4
Hunter River A. and H. Association (West Maitland)	E. H. Fountain	,, 3, 4, 5
Berrima District A., H., and I. Society (Moss Vale)	J. W. Kenny	,, 3, 4, 5
Camden A., H., and I. Society	A. E. Baldock	,, 3, 4, 5
Bellinger River A. Association	J. F. Reynolds	,, 4, 5
Mudgee A., P., H., and I. Association	E. J. Hannan	,, 8, 9, 10
Glen Innes P. and A. Society	Geo. A. Priest	,, 8, 9, 10
Moruya A. and P. Society	H. P. Jeffery	,, 9, 10
Tumbarumba and Upper Murray P. and A. Society	E. C. Cunningham	,, 9, 10
Gloucester P., A., and H. Society	F. H. Chester	,, 10, 11
Goulburn A., P., and H. Society	F. D. Hay	,, 10, 11, 12
Batlow A. Society	C. S. Gregory	,, 15, 16
Armidale and New England P., A., and H. Assocn.	A. H. McArthur	,, 15 to 18
Upper Hunter P. and A. Association	R. C Sawkins	,, 16, 17
Gundagai P. and A. Society	H. W. Simpson	,, 16, 17
Macleay A., H., and I. Association (Kempsey)	E. Weeks	,, 16, 17, 18
Royal Agricultural Society of N.S.W.	H. M. Somer	,, 21 to 30
Upper Manning A. and H. Association (Wingham)	D. Stewart	April 13, 14
Narrabri P., A., and H. Association	C. C. Baker	,, 13, 14, 15
Orange A. and P. Association	G. W. Williams	,, 13, 14, 15
Clarence P. and A. Society (Grafton)	L. C. Lawson	,, 13 to 16
W.D.A. and H. Society (Nabiac)	G O'Connor	,, 21, 22
Dungog P. and A. Association	W. H. Green	,, 28, 29, 30

[Subsequent fixtures are noted but held over.]

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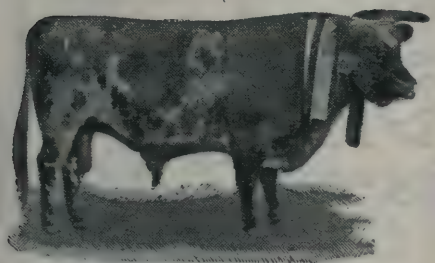

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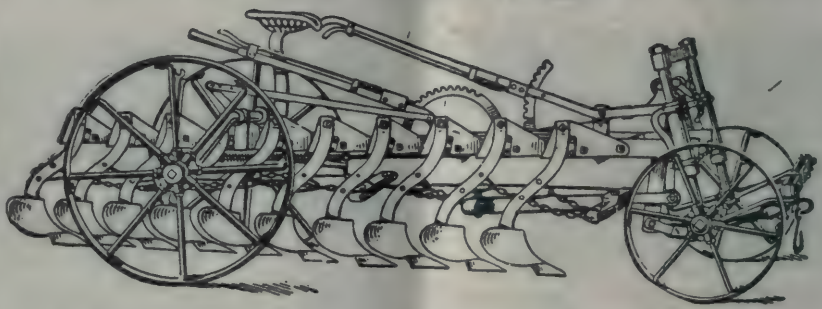

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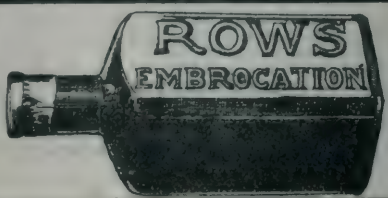

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616	Berkshire Boar ...				
617	Berkshire Boar ...				
620	Berkshire Boar ...				
621	Berkshire Sow ...				
622	Berkshire Boar ...	Koramburra Major, No. 520a	Callan Park Birdy, No. 520b	Sept. 17	7 7 0
623	Berkshire Sow ...				
624	Berkshire Sow ...				
625	Berkshire Sow ...				
628	Berkshire Boar ...	Koramburra Major, No. 520a	Callan Park Lady, No. 520c.	Oct. 17	6 6 0
629	Berkshire Boar ...				
630	Berkshire Sow ...				
631	Berkshire Sow ...				
632	Berkshire Sow ...				
633	Berkshire Sow ...				
634	Berkshire Sow ...				
635	Berkshire Sow ...				
636	Berkshire Sow ...				
637	Berkshire Boar ...	Callan Park Dan, No. 600a	Callan Park Alice, No. 520e	Oct. 27	6 6 0
638	Berkshire Boar ...				
639	Berkshire Boar ...				
640	Berkshire Sow ...				
641	Berkshire Sow ...				
642	Berkshire Boar ...	Callan Park Dan, No. 600a	Callan Park Lucy, No. 520d	Nov. 2	6 6 0
643	Berkshire Boar ...				
644	Berkshire Boar ...				
645	Berkshire Sow ...				
646	Berkshire Sow ...				
647	Berkshire Sow ...				
648	Berkshire Sow ...				
649	Berkshire Sow ...				
650	Berkshire Boar ...	Koramburra Major, No. 520a	Callan Park Patsy, No. 484	Nov. 8	6 6 0
651	Berkshire Sow ...				
652	Berkshire Sow ...				
653	Berkshire Sow ...				
654	Berkshire Sow ...				
655	Berkshire Sow ...				
656	Berkshire Sow ...				

Prices quoted include delivery in crates at Darling Harbour or Wharf at Sydney.

A full pedigree is furnished with every pig sold.

All communications to be addressed to—
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(Please add Exchange for Country Cheques.)

12th December, 1920. **R. KIRKPATRICK, Manager.**

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1 mile 5-wire fence, 12 x 14 gauge Buffalo, costs £24 3s. 6d., and has 300-lb. greater breaking strain than No. 8 Galvanised, which costs £48 10s. for 1 mile 5-wire fence.
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1 Mile 12 x 14 gauge measures 19 miles.
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We also stock 11 x 13, 10 x 12 Buffalo Oval, which shows the same saving and greater strength over No. 6 and 7 ordinary fencing wire.

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D. It saves 66⅔ % in Transit Charges.
E. Reduces Labour Charges in erecting fence.
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H. It will keep your stock where you want them.
I. It Saves the Cost of Re-straining and reduces Labour Cost.

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1-ply, per roll, complete with cement and nails					...	... 51/6
2-ply	„	„	„	„	...	... 63/6
3-ply	„	„	„	„	...	... 77/6

1 roll of Rex Flintkote Roofing covers 200 square feet, or the same space that 17 sheets of iron covers.

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Hardwoods of Australia and their Economics	25/-	27/4
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GUERNSEY BULL.

George III (15 A.G.H.B.)

Sire, King of the Roses (28 A.G.H.B.)

Dam, Calm II (23 A.G.H.B.)

Yield of Dam, 7,548 lb. milk and 503 lbs. butter in 287 days.

OTHER SIRES IN USE:

FAITHFUL FIDO (81) by Hayes' Fido (imp.) (24).

Yield of HOPE (280), full sister to Faithful Fido, 7,539 lb. milk and 496·9 lb. butter in 243 days (test incomplete).

ROSE CHIEF OF WOLLONGBAR (130), by Godolphin Moses (imp.), Dam, Parson's Red Rose I (imp.) (138).

Yield of Dam, 6,999 lb. milk and 452 lb. butter in milking period.

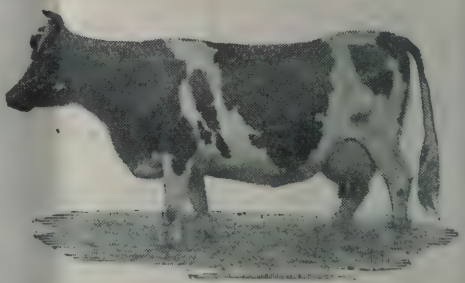
GUERNSEY COW.

Parson's Red Rose II (imp.)
(139 A.G.H.B.)

Yield, 8,865 lb. milk and 655·65 lb. butter in 365 days.

Sire, Gil Blas (1,679 P.S., R.G.A.S.)

Dam, Parson's Red Rose (2,813 F.S., R.G.A.S.)



GUERNSEY COW.

Beatrice of Berry (8 A.G.H.B.).

Yield, 5,566 lb. milk and 362 lb. butter in milking period on first calf.

Sire, Royal Blood VI.

Dam, Beatrix XIV (imp.).

PURE-BRED YOUNG BULLS of the following breeds—MILKING SHORTHORN, JERSEY, GUERNSEY, AYRSHIRE, and RED POLL—always available for Sale.

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MILKING SHORTHORN BULL.

Melba's Emblem of Darbalara (461, M.S.H.B.).

Sire, Emblem of Darbalara (100 M.S.H.B.)

Dam, Melba III of Darbalara (1058 M.S.H.B.)

Yield of Dam, 15,239 lb. milk and 653·65 lb. butter in 365 days.

OTHER SIRES IN USE:

RUTLAND OF DARBALARA (575 M.S.H.B.), by Emblem of Darbalara (100).

Yield of Dam, 12,324 lb. milk and 579 lb. butter in 365 days.

COMRADE OF DARBALARA (Vol. V, M.S.H.B.), by Silver Mine of Darbalara (592).

Yield of Dam, 8,436 lb. milk and 398 lb. butter in 273 days as a 2-year old.

NEWHAVEN OF DARBALARA (Vol. V, M.S.H.B.), by Lily's Cupid of Darbalara (431) (half-brother of Emblem of Darbalara).

Yield of Dam, 9,163 lb. milk and 419 lb. butter in 365 days when 16 years old.

MILKING SHORTHORN COW.

Gibson Girl (1,465, imp.).

Yield, 10,702 lb. milk and 494·79 lb. butter in 365 days.

G. VALDER,

Under Secretary and Director, Department of Agriculture, Sydney.

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Representatives of the Government Herds.

AYRSHIRE BULL.

Isabel's Majestic (861 A.A.H.B.).

Sire, Majestic of Oakbank (326 A.A.H.B.)
Dam, Isabel of Gleneira (1,036 A.A.H.B.)
1st Prize and Reserve Champion, Melbourne, 1913.
1st Prize and Reserve Champion, Sydney, 1914.

OTHER SIRES IN USE:

RODERICK OF WILLOWVALE (Vol. X, A.A.H.B.), by Lancer of Willowvale (757).

SPORTSMAN OF KABIBINOKKA (Vol. X, A.A.H.B.), by Jamie of Kabibinokka.
Yield of Dam, 8,563 lb. milk and 351 lb. butter in 273 days.

SIR ROBERT OF KABIBINOKKA (2,602), by Robin of Glengarnock (899), Dam, Mona of Kabibinokka (4,535).
Yield of Dam, 10,324 lb. milk and 487·56 lb. butter in 273 days.

AYRSHIRE COW.

Black Cap III (Vol. X, A.A.H.B.).

Yield, 7,155 lb. milk and 362·04 lb. butter in 259 days.
Sire, Punch of Glen Innes (Vol. X, A.A.H.B.)
Dam, Black Cap II.

RED POLL COW.

Melody II.

Yield, 11,240 lb. milk and 530·04 lb. butter in 365 days.
Sire, Acton Ajax (imp.) (9,655).
Dam, Melody by Antic (imp.) (7,799).

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STUD DAIRY CATTLE.

Representatives of the Government Herds.

JERSEY BULL.

Xmas Fox (imp.) (947.)

Sire, Silver Fox (10,097, E.H.B.)

Dam, Malvoisie (Vol. XX, E.J.H.B.)

Butter record of Dam, Royal Counties Show England, 2 lb. 6¼ oz. from 49 lb. milk in 24 hours, 165 days after calving.

OTHER SIRES IN USE:

GODDINGTON NOBLE XV (948) (imp.)

Yield of Dam, 8,150 lb. milk; butter yield, 1 lb. 11 oz. from 32 lb. milk in 24 hours as 3-year old.

RETFORD WINKS (yield of Dam, 6,595 lb. milk and 401 lb. butter in 273 days as 2-year-old.)

JANET QUEEN 4TH'S BRIGHTON of Coolangatta, by Brighton King of Coolangatta.

LORD SILVERMINE II of Banyule (yield of Dam, 7,592 lb. milk and 461 lb. butter in 273 days.)

JERSEY COW.

Glory Quayle (4,822)

Yield, 8,592 lb. milk and 495·48 lb. butter in 273 days (second calf).

Sire, Xmas Fox (947) (imp.)

Dam, Egypt's Glory (383).

Yield of Dam, 6,154 lb. milk and 399 lb. butter in 365 days as 3-year-old.

JERSEY COW.

Wagga Jasmine (2,779).

Yield, 11,864 lb. milk and 894·94 lb. butter in 365 days.

Sire, Kaid of Khartoum (949).

Dam, Wagga Larkspur.

PURE-BRED YOUNG BULLS of the following breeds—MILKING SHORTHORN, JERSEY, GUERNSEY, AYRSHIRE, and RED POLL—always available for Sale.

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THE RETURNED SOLDIERS AND SAILORS' EMPLOYMENT ACT compels, with few exceptions :—

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Labour Exchanges and Immigration Branch.
76 Elizabeth Street, Sydney.

PRICE LIST OF PURE BRED PIGS FOR SALE AT HOSPITAL, GLADESVILLE.

(The prices quoted hold good for the current month only.)

No.	Description.	Sire.	Dam.	Date Farrowed.	Price Each.
				1920.	£ s. d.
2347–48	Mid. York. Sows	Sundon Syd. (Imp.)	Moredun Maid ...	Jan. 12	11 11 0
2378	Mid. York. Boar	Sundon Sydney (Imp.)	College Rambling Rose.	Feb. 21	12 12 0
2381	Mid. York. Sow				11 11 0
2396	Berkshire Boar ...	Lockhaven Didymus	Gladesville Queen	Mar. 12	11 11 0
2424–5–6	Large York. Boars	Hawkesbury Ferryman	Brighton Lass ...	May 17	11 11 0
2440–1	Large York. Boars	King Charles II ...	Glad'ville Empress II...	June 2	10 10 0
2445–6–7	Large York. Boars	Hawkesbury Ferryman	Brighton Lady ...	June 20	10 10 0
2458-9-60-1	Mid. York. Boars	Gladesville Grand Boy	Gladesville Lila ..	July 12	10 10 0
2474	Large York. Sow	Hawkesbury Ferryman	Gladesville Bourne III	Aug. 5	9 9 0
2475–76	Mid. York. Boars	Sundon Sydney (Imp.)	Glad'ville Maid III	Aug. 5	11 11 0
2477–78	Mid. York. Sows				10 10 0
2486	Berkshire Sow ..	Herrison King ...	Primrose II ...	Aug. 12	9 9 0
2488–89	Mid. York. Sows	Sundon Syd. (Imp.)	Gladesville Maid ..	Aug. 18	10 10 0
2492	Mid. York. Boar	Gladesville Grand Boy	College Rambling Rose	Aug. 29	10 10 0
2493–94–95	Mid. York. Sows				9 9 0
2496–97–98	Mid. York. Boars	Gladesville Grand Boy	Joan	Sept. 8	9 9 0
2499–500–1	Mid. York. Sows				8 8 0
2505	Berkshire Sow ...	Herrison King	Glad'ville Queen II	Sept. 24	8 8 0
2507–8–9	Berkshire Boars...		Short Face Jane III	Sept. 29	9 9 0
2510–11	Large York. Boars	King Charles II	Glad'ville Empress IV	Oct. 1	9 9 0
2512–13	Large York. Sows				8 8 0
2517–18	Berkshire Sows ...	Whitley Wales (Imp.)	Glad'ville Nancy II	Oct. 7	9 9 0
2519	Berkshire Boar ...	Glad'ville Longfellow II	Polly Pry V ...	Oct. 8	9 9 0
2520–21	Berkshire Sows ...				8 8 0
2524	Mid. York. Boar	Surdon Sydney (Imp.)	Gladesville Snowdrop.	Sept. 30	10 10 0
2525	Mid. York. Sow ..				9 9 0
2526–27	Large York. Boars	Hawkesbury Ferryman	Gladesville Empress V	Sept. 30	9 9 0
2528	Berkshire Boar ...	Whitley Wales (Imp.)	Herrison Queen V	Oct. 23	10 10 0
2529–30–1	Berkshire Sows ...				9 9 0
2532–33–34	Berkshire Boars ...	Whitley Wales (Imp.)	Polly Pry VII ...	Oct. 29	10 10 0
2535–36–37	Berkshire Sows ...				9 9 0

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Jan., 1921. **W. A. E. LEWIS, Manager, Gladesville Hospital.**

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Hawkesworth's Australian Sheep and Wool. Price, 24/-; by post, 24/5.

Smith's Sheep and Wool Industry of Australasia. A practical handbook for Sheep Farmers and Wool-Classers. Price, 8/6; by post, 9/-.

Pigs and their Management. By H. W. Potts, Principal, Hawkesbury Agricultural College. Price, 4/9; by post, 5/-.

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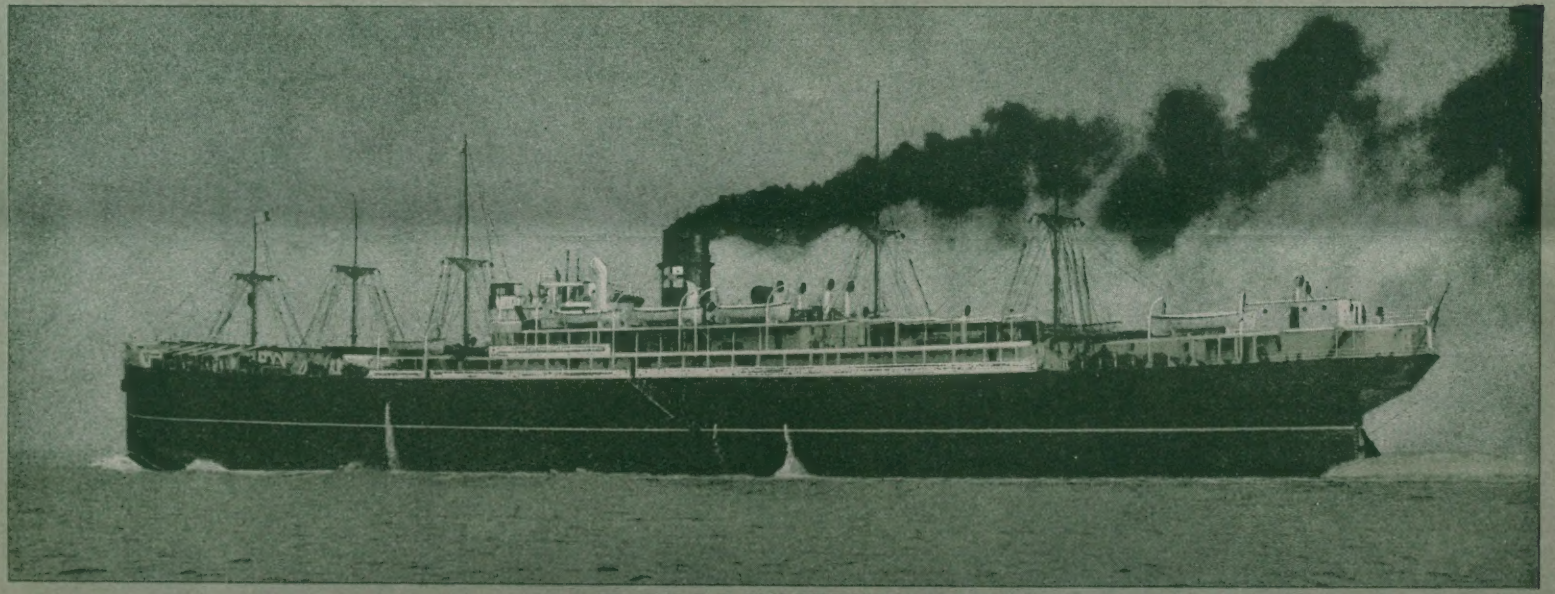

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